A1

Environmental Assessment

Waste Treatment Facility

OWMC
Ontario Waste Management Corporation

A provincial crown corporation.

Ontario Waste Management Corporation

Environmental Assessment

December, 1986

Environmental Assessment

Table of Contents

	Page
INTRODUCTION	1
CHAPTER 1: PURPOSE OF THE UNDERTAKING	5
A. STATEMENT OF PURPOSE OF THE UNDERTAKING	5
B. GOVERNMENT POLICY AND OWMC'S MANDATE	5
CHAPTER 2: DESCRIPTION OF THE UNDERTAKING	8
A. THE UNDERTAKING	8
1. Site	8
2. Conceptual Design	9
3. Market Area	20
4. Waste Management System	22
5. Expansion	22
6. Detailed Design	23
7. Operation, Maintenance and Replacement	23
8. Retirement and Decommissioning	23
9. Further Detail	23
CHAPTER 3: THE SPECIAL WASTE PROBLEM IN ONTARIO	24
A. DEFINING SPECIAL WASTE	24
B. ONTARIO'S SPECIAL WASTE	25
1. The Characteristics of Waste	27
2. Waste Distribution	29
3. Destinations of Special Waste	30
C. EFFECTS OF SPECIAL WASTE	32
CHAPTER 4: ALTERNATIVES TO THE UNDERTAKING	38
A. EXAMINING CONCEPTUAL ALTERNATIVES	39
1. Identifying Alternatives for Consideration	40
2. Alternatives Rejected in Principle	40
3. Mitigation of Remaining Alternatives	42
4. Conceptual Alternatives Chosen for Analysis	42
B. EVALUATION CRITERIA AND METHOD	42
1. Evaluation Criteria	43
2. Evaluation Method	43

TABLE OF CONTENTS
(continued)

	Page
CHAPTER 4: ALTERNATIVES TO THE UNDERTAKING (cont'd)	
C. EVALUATION OF ALTERNATIVES TO THE UNDERTAKING	45
1. Four R Program Only, Operated by OWMC	45
2. Four R Program With Active Support for Private Waste Treaters	46
3. Partial OWMC Facilities	49
4. Mobile OWMC Facilities	51
5. Dispersed, But Fixed OWMC Facilities	52
D. FINDINGS AND CONCLUSIONS	55
CHAPTER 5: MANAGEMENT OF SPECIAL WASTE	58
A. THE SPECIAL WASTE MARKET	58
1. The Waste Management Hierarchy	58
2. The Waste Management Gap	60
B. OWMC'S ROLE - THE "PRIORITY WASTE" MANAGER	62
CHAPTER 6: ALTERNATIVE METHODS - TREATMENT AND DISPOSAL TECHNOLOGIES	68
A. FACILITY DESIGN AND DEVELOPMENT PROCESS	68
B. GENERIC TECHNOLOGIES AND SYSTEM OPTIONS EVALUATION	71
1. Description of Existing Environment Affected by Alternatives	79
2. Prediction of Effects of the Alternatives	80
3. Mitigation or Changes and Improvements of the Alternatives	80
4. Net Effects of the Evaluation	81
C. COMPONENT TECHNOLOGIES EVALUATION AND CONCEPTUAL DESIGN AND OPERATIONS	82
1. Four Main Process Areas	82
2. Capacity of Facility	96
3. Optimization Issues	99

TABLE OF CONTENTS
(continued)

	Page
CHAPTER 7: ALTERNATIVE METHODS - SITE SELECTION	108
A. INTRODUCTION	108
1. Site Selection Goals and Objectives	111
2. Site Selection Principles	112
3. Facilities Characteristics Assumptions	114
B. NARROWING THE SEARCH	114
1. Definition of the Study Area	114
2. Rationale for Narrowing the Search to the Selected Geographic Region	115
C. IDENTIFICATION OF CANDIDATE AREAS	122
1. Factor Identification	122
2. Data Collection and Analysis	123
3. Factors - Characteristics and Distinctions	123
4. Candidate Area Identification Process	126
5. Rationale for Excluding Areas	126
6. Candidate Areas	129
7. Comparison of Excluded Areas With Candidate Areas	131
D. IDENTIFICATION OF CANDIDATE SITES	131
1. Site Area Identification Process	132
2. Potential Site Identification Process	139
3. Candidate Site Identification Process	148
E. SELECTION OF THE PREFERRED SITE	160
1. Step 1: Data Collection and Factor Identification	160
2. Step 2: Refinement of Siting Options	163
3. Step 3: Comparison of Siting Options	165
4. Step 4: Choosing the Preferred Site	171
5. Step 5: Confirmation of Comparative Evaluation	174
CHAPTER 8: CONCLUSION - ADVANTAGES AND DISADVANTAGES OF THE UNDERTAKING	180
A. FACILITY CHARACTERISTICS	181
1. Initial Start-Up of the Facility	182
2. Operation of the Facility	183

TABLE OF CONTENTS

(continued)

	Page
CHAPTER 8: CONCLUSION - ADVANTAGES AND DISADVANTAGES OF THE UNDERTAKING (cont'd)	
B. LOCAL ENVIRONMENTAL EFFECTS	193
1. Existing Environment: Major Characteristics of the Site and Vicinity	193
2. Potential Environmental Effects and Mitigation: Local Level	197
C. PROVINCIAL ENVIRONMENTAL EFFECTS	217
1. Existing Environment	217
2. Potential Environmental Effects and Mitigation	218
D. FURTHER WORK IN PROGRESS	220
1. Provincial Level Studies	220
2. Local Level Studies: Phase 4B Site Assessment Program	221
E. RATIONALE FOR THE UNDERTAKING	230

APPENDICES

APPENDIX A: OWMC ACT

APPENDIX B: ORDER-IN-COUNCIL 1779/85

APPENDIX C: LEGAL PLAN OF SURVEY

APPENDIX D: LIST OF SUPPORTING DOCUMENTS

TABLE OF CONTENTS
(continued)

FIGURES

		Page
INTRODUCTION		
I-1	Facilities Development Process	3
CHAPTER 2		
2.1	Site Location and Access	10
2.2	Perspective of Proposed Facility on the Site	11
2.3	Site Servicing Proposal	19
2.4	Central Operating Area - Layout	21
CHAPTER 3		
3.1	Disposal of Organic and Inorganic Special Waste in Ontario	31
CHAPTER 5		
5.1	Organic Special Waste - Filling the Gap	63
5.2	Inorganic Special Waste - Filling the Gap	64
CHAPTER 6		
6.1	Relationship of Evaluation Criteria to OWMC Goals	78
6.2	Flow Diagram of Supporting Documents	83
6.3	Pictorial Flow Diagram - Incineration	86
6.4	Pictorial Flow Diagram - Physical/Chemical Treatment	89
6.5	Pictorial Flow Diagram - Solidification	92
6.6	Development of Waste Profiles	101

TABLE OF CONTENTS
(continued)

FIGURES

		Page
CHAPTER 7		
7.1	Step-by-Step Approach to Site Selection	110
7.2	Hydrogeological Inventory for Waste Facilities Development - Southern Ontario	118
7.3	Special Waste Distribution in Southern Ontario (Estimated)	119
7.4	Selected Geographic Region	121
7.5	Candidate Areas Within the Geographic Region	130
7.6	Choosing Candidate Sites	133
7.7	Site Area Identification Process	134
7.8	Constraint Map - Example, Site Area Identification	138
7.9	Site Areas - Physical/Chemical Treatment Plants and Incinerators	140
7.10	Site Areas - Engineered Landfill or Integrated Facility	141
7.11	Potential Site Identification Process	142
7.12	Potential Sites	147
7.13	Candidate Site Identification Process	149
7.14	Example of Partially Integrated Siting Option LF-4N/PI-13N	150
7.15	Candidate Sites	161
CHAPTER 8		
8.1	Arrangement of Central Operating Area	188
8.2	Preferred Site	194

TABLE OF CONTENTS
(continued)

TABLES

		Page
CHAPTER 3		
3.1	Estimates of Waste Generation in Ontario	26
3.2	Physical and Chemical Characteristics of Waste in 1983	28
CHAPTER 4		
4.1	Criteria Used to Evaluate Conceptual Alternatives	44
4.2	Final Ranking of Alternatives	57
CHAPTER 6		
6.1	Available Generic Treatment/Disposal Technologies	74
6.2	Criteria Used to Evaluate Component Technologies	84
6.3	Preferred Physical/Chemical Treatment Technologies	88
6.4	Landfill Alternatives - Evaluation Criteria and Sub-Criteria	94
6.5	November 1984 - Waste Profile	104
CHAPTER 7		
7.1	OWMC Site Selection Process	109
7.2	Reasons for Exclusion	128
7.3	Summary of Conclusions for Risks and Impacts, LF-9C vs. LF-1E/PI-27E	173

Introduction

The Ontario Waste Management Corporation (OWMC) is a provincial Crown Agency formed by an Act of the Ontario legislature in July, 1981. Recognizing the seriousness of the province's hazardous and liquid industrial waste problem and the need for full service waste treatment facilities, the Ontario government created OWMC with a mandate to develop a province-wide industrial waste management system.

OWMC is preparing to apply to the Minister of the Environment for approval to build and operate a waste treatment and disposal facility consisting of an incineration plant, a physical/chemical treatment plant, a solidification plant and an engineered landfill, all on a site of approximately 124 hectares being parts of Lots 17 and 18, Concession 3, formerly in the Township of Gainsborough, now the Township of West Lincoln, Regional Municipality of Niagara.

The Environmental Assessment Act, R.S.O. 1980, c. 140, requires OWMC, as proponent of an undertaking, to submit to the Minister an environmental assessment of the enterprise or activity or a proposal, plan or program in respect of an enterprise or activity. This Submission deals with the planning decisions that led to the identification of a preferred conceptual facility design and a preferred site ("Plan Stage Undertaking"). OWMC has prepared it in accordance with the General Guidelines for the Preparation of Environmental Assessments, as revised in 1982. This EA incorporates by reference portions of reports which are filed with and form part of the EA. These reports are listed in Appendix D.

OWMC's Plan Stage EA is the first of two environmental assessments covering OWMC's Facility. Later in 1987, once OWMC's detailed site assessment studies are complete, it will submit a further environmental

assessment which will provide additional site specific information on the environmental acceptability of the site, construction, operation, maintenance and proposed impact management strategies associated with the project ("Implementation Stage EA"). The implementation stage EA will also respond to any concerns raised by the reviewers of this EA.

Over the past five years, OWMC has conducted a process referred to as the Facilities Development Process (Figure 1-1). The Corporation retained consultants with expertise in a wide variety of disciplines including hydrogeology, transportation, technology assessment, engineering, agriculture, biology, air dispersion, waste analysis, socio-economics and risk assessment among others.

OWMC has carried out its work on the basis of three goals. In order of priority, they are:

1. to minimize risk to human health;
2. to minimize environmental impact;
3. to minimize financial cost to OWMC and the people of Ontario.

Throughout this process, OWMC has consulted regularly with the Ontario public, keeping citizens informed on the progress to date and the reasons for the various decisions made. A description of this public consultation is provided in the "Public Consultation Report", 1987, by OWMC (E1[1]).

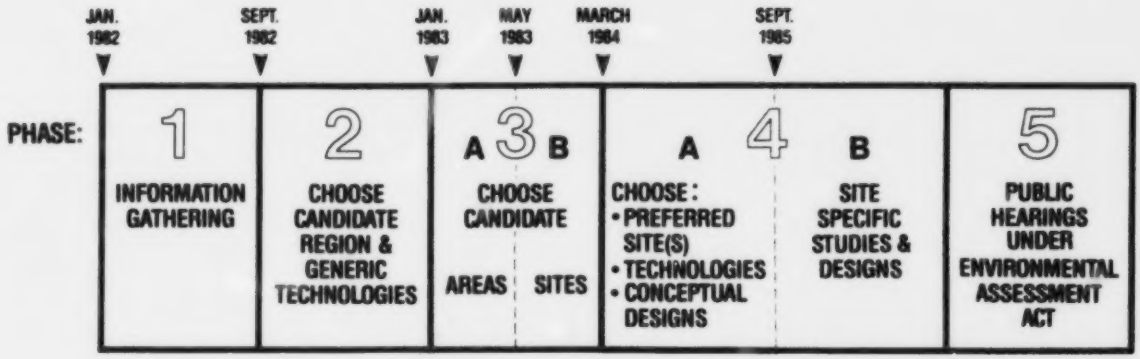
The following is a summary of the Chapters in the EA:

Chapter 1 defines the purpose of the undertaking: that is, the end which the proposed undertaking is intended to achieve.

Chapter 2 describes the undertaking: that is, the means of achieving the end described in Chapter 1.

[1] This is the number system used for references. Each document is described fully (including date of issue) in Appendix D.

Figure I.1
Facilities Development Process
Source: OWMC, Phase 4A Report,1985



Chapter 3 describes the problem presented by special waste in the Ontario environment, a description of special waste characteristics, distribution and destinations, as well as evidence of environmental effects and the health risk implications.

Chapter 4 examines alternatives to OWMC's undertaking to help solve the special waste problem in Ontario today.

Chapter 5 deals with marketing the waste management services that OWMC and its facilities will provide.

Chapter 6 evaluates alternative methods of treatment and disposal. The decision making processes which lead to the proposed facility design are included in this chapter.

Chapter 7 presents the site selection process and the evaluation of the advantages and disadvantages of the locations considered, with the rationale for the selection of the preferred site.

Chapter 8 contains an evaluation of the advantages and disadvantages to the provincial environment of OWMC's undertaking, considering the alternative methods of carrying out the undertaking and the alternatives to the undertaking.

Chapter 1:
Purpose of the Undertaking

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Purpose of the Undertaking

A. STATEMENT OF PURPOSE OF THE UNDERTAKING

The purpose of this undertaking is to help to minimize the risks to human health and the environment caused by the improper disposal of liquid industrial and hazardous wastes through the provision of treatment and disposal facilities.

B. GOVERNMENT POLICY AND OWMC'S MANDATE

OWMC is an integral component of the Ontario Government's strategy to reduce the impact of hazardous waste damage on the environment of Ontario. Other components of this strategy include the Blueprint for Waste Management in Ontario (1983), amendments to Regulation 309 (1985), the Municipal-Industrial Strategy for Abatement, 1986 (MISA), and forthcoming amendments to Regulation 308. The MISA document spoke of "a comprehensive approach to all of Ontario's toxic waste management programs" (MISA, p.10).

The OWMC Act gave the Corporation a statutory mandate to establish activities, enterprises, and facilities to help solve Ontario's hazardous waste problem (Appendix A).

OWMC is required by law to construct facilities. The OWMC Act states that the objects of the Corporation are:

a) to research, develop, establish, operate and maintain facilities for the transmission, reception, collection, examination, storage, treatment and disposal of wastes including sewage; and

b) to perform such other duties as may be assigned to it under this or any other Act. (Section 3, OWMC Act.)

Section 3 clearly requires OWMC to "establish, operate and maintain facilities...." In addition, a succession of Orders-in-Council made under the OWMC Act show that the Government believes there is a need for OWMC facilities to improve treatment and control of hazardous wastes.

O/C 1985/81 states:

...there is a pressing need in Ontario to establish waste disposal facilities for the treatment and disposal of liquid industrial waste and hazardous waste.

The Order went on to state that:

The Government of Ontario determined that the Ontario Waste Management Corporation should be charged with the responsibility of providing the Facilities by establishing and operating one or more waste disposal and ancillary facilities ... in the former Township of South Cayuga.

Orders-in-Council 1706/84 and 1707/84 revoked O/C 1985/81 and further defined OWMC's responsibilities by stating that:

The Corporation should establish, in accordance with the Act, one or more waste disposal facilities (each of which is referred to as a "Facility") for the transmission, reception, collection, examination, storage treatment or disposal of liquid industrial waste and hazardous waste in Ontario, one of which shall be a secure landfill site, at one or more sites to be chosen by the Corporation (each of which is referred to as a "Site")...(emphasis added), (O/C 1706/84 and 1707/84).

O/C 1707/84 also stated that:

the Corporation may take steps to initiate, stimulate and encourage the recycling, reduction, recovery and exchange of liquid industrial waste and hazardous waste by others.

O/C 1779/85 removed OWMC's exemption from the Environmental Assessment Act and revoked O/C 1706/84 and 1707/84. O/C 1779/85 states that:

> The Corporation shall follow the following policies:
>
> a) It shall find one or more sites at locations other than the property described in the Schedule to the Act (i.e. South Cayuga) suitable for the establishment of one or more facilities; and
>
> b) A facility proposed by the Corporation shall not be established on a site proposed by the Corporation until any necessary approvals under the Environmental Assessment Act, the Environmental Protection Act, the Ontario Water Resources Act and any other applicable statutes are obtained. (O/C 1779/85)

The recitals to O/C 1779/85 stated that it was meant to "provide for the continued application of those policies set out in Order-in-Council No. O/C 1707/84 which do not relate to the hearing process".

The most recent Memorandum of Understanding with the Minister of the Environment, dated October 31, 1986 stated that:

> a primary goal of the Minister is to ensure that the Corporation establishes environmentally sound facilities for the treatment and disposal of liquid industrial waste and other hazardous waste. (Section 1.4)

In short, OWMC was, and is, required to establish facilities at one or more sites for improved waste treatment and disposal. The undertaking to provide these initial facilities should be considered in the context of OWMC's mandate within the field of managing hazardous wastes.

Chapter 2:
Description of the Undertaking

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Description of the Undertaking

OWMC requests:

a) A notice in writing pursuant to section 12(2) of the EAA requiring the Environmental Assessment Board or Joint Board ("the Board") to hold a hearing with respect to:

- the acceptance or amendment and acceptance of OWMC's Plan Stage EA;
- whether approval to proceed with the plan stage EA should be given; and
- whether the approval to proceed with the plan stage EA given should be subject to terms and conditions and, if so, the provisions of such terms and conditions.

b) An order of the Board:

- accepting OWMC's Plan Stage EA; and
- approving OWMC's plan to proceed with its plan stage EA.

A. THE UNDERTAKING

1. Site

The undertaking for which OWMC seeks approval consists of OWMC's proposals and plans for the selection of a site and the identification of a

conceptual design for its proposed waste treatment facility in the Township of West Lincoln, Regional Municipality of Niagara. This facility consists of an incineration plant, a physical/chemical treatment plant, a solidification plant and an engineered landfill, all on a site of 124 ha. Figure 2.1 shows the location of the site and the preferred access route. Figure 2.2 provides a perspective of the proposed facilities on the site. Appendix C consists of the legal boundary plan and survey of the site.

2. Conceptual Design

The conceptual design for which approval is sought provides for the high temperature destruction of organic wastes in a rotary kiln incineration system and the detoxification, stabilization and reduction of inorganic wastes by physical/chemical treatment. Treated residues from physical/chemical treatment and incineration processes, with the exception of slag, will be solidified and disposed of in an engineered landfill. Slag will be disposed of directly into the landfill.

This conceptual design is described in detail in the OWMC Treatment Facility/Facility Description report by Monenco Ltd. 1986 (C1), which forms part of this EA. Further detail on the evaluation of alternative technologies and system optimization for each of the five main process areas is provided in: OWMC Treatment Facility/Process Area Report; Incineration (C6); Physical/Chemical Treatment (C7); Solidification (C8); and General Facilities (C10), all by Monenco Ltd. 1986; and OWMC Treatment Facility/Process Area Report/Engineered Landfill by M.M. Dillon Ltd. for Monenco Ltd. 1986 (C9), which also form part of this assessment.

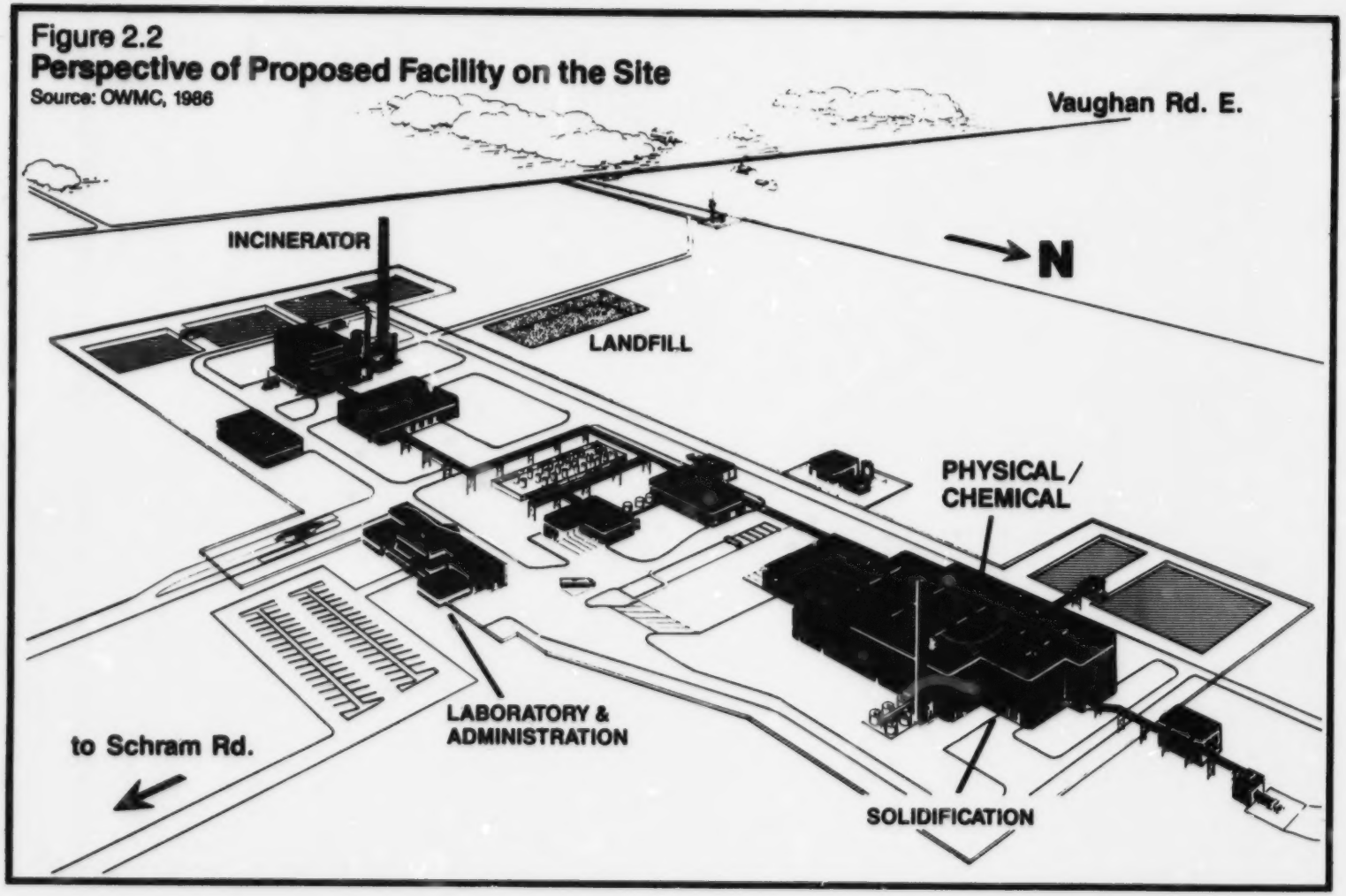
A brief description of the five process areas follows.

a) Incineration Plant

The incineration plant will consist of the following main components:

Figure 2.1
Site Location and Access
Source: OWMC, Phase 4A Report,1985

Figure 2.2
Perspective of Proposed Facility on the Site
Source: OWMC, 1986



- o combustion system:
  - rotary kiln incinerator
  - secondary combustion chamber.

- o flue gas cooling system:

  - waste heat recovery boiler.

- o flue gas treatment system;
  - spray dryer
  - electrostatic precipitator
  - three-stage wet scrubber
  - 60 metre stack.

The rotary kiln will have a nominal capacity to treat 30 000 tonnes per annum (t/a) of organic waste with a rated thermal capacity of 66.64 gigajoules per hour (GJ/h). Provision is made for doubling this capacity by adding a second incineration plant if required, but this is not part of the present submission. The 60 m stack has provision for two flues so that a second stack will not be needed if a second incineration plant is added (Monenco, C1 and Monenco C6).

b) Physical/Chemical Treatment

The physical/chemical treatment plant will incorporate three process treatment systems corresponding to the three categories of waste which are expected to require physical/chemical treatment as follows:

- o An inorganic treatment system designed to treat inorganic special wastes delivered to the facility and inorganic wastes generated on-site such as ventilation air scrubber blowdown, truck wash water and flushing water.

- o An aqueous organic treatment system designed to treat selected aqueous organic wastes and wastes generated on-site such as truck wash water and flush water containing diluted organic contaminants.

- A miscellaneous treatment system designed to treat contaminated landfill leachate and contaminated surface drainage.

The inorganic treatment system will consist of the following unit processes:

- Primary treatment:
  - phase separation;
  - dissolution/slurrying; and
  - blending.

- Secondary treatment:
  - oxidation/reduction;
  - neutralization/precipitation;
  - coagulation/sedimentation; and
  - sludge dewatering.

- Intermediate storage.

- Effluent polishing:
  - granular media filtration;
  - activated carbon adsorption; and
  - reverse osmosis.

- Final treated effluent storage.

- Evaporation.

Evaporation will serve in the physical/chemical treatment plant as a treatment step for removing high concentrations of total dissolved solids (> 4 percent by weight) from partially treated effluents prior to reuse. In addition, evaporation provides the means for disposing of excess treated effluent which cannot be reused on-site.

The aqueous organic treatment system will consist of the following unit processes:

- o Primary treatment:
  - phase separation; and
  - blending.

- o Secondary treatment:
  - emulsion breaking;
  - centrifugation; and
  - dissolved air flotation.

- o Polishing:
  - activated carbon adsorption.

- o Intermediate storage.

  From intermediate storage, batches of partially treated aqueous organic wastes will receive additional secondary and/or effluent polishing treatment in the inorganic treatment system.

The miscellaneous treatment system will consist of the following unit processes:

- o Primary/secondary treatment:
  - equalization;
  - neutralization/precipitation;
  - flocculation/sedimentation; and
  - sludge dewatering.

- o Effluent polishing:
  - granular media filtration;
  - activated carbon adsorption; and
  - reverse osmosis.

- o Final treated effluent storage.

- o Evaporation.

The physical/chemical treatment plant will have an initial capacity of 50 000 t/a based on one 8-hour shift, 5 days a week and a nominal capacity to handle 120 000 t/a based on working 24 hours a day, five days a week. In establishing site size and servicing requirements, provision has been made to expand, if necessary, to a capacity of 240 000 t/a (Monenco, C1 and Monenco, C7), but such expansion is not part of this submission.

c) Solidification Plant

The solidification plant will incorporate two process treatment systems corresponding to the categories of residues which require solidification treatment, as follows:

- A treatment system utilizing Portland cement based technologies with minor additives (lime, clay, flyash or soluble silicate) for the solidification of residues with high contents of solids.

- A treatment system utilizing Portland cement/soluble silicate technology for the solidification of residues with low contents of solids.

The solidification plant will have a capacity to process the treated residues from a physical/chemical treatment plant processing 120 000 t/a of inorganic waste and an incineration plant processing 30 000 t/a of organic wastes. The solidification plant can be expanded to treat residues from twice those volumes if required, but such expansion is not proposed in this submission (Monenco, C1 and Monenco, C8).

d) Engineered Landfill

The solidified materials and incinerator slag will be disposed of in the engineered landfill of the shallow entombed design, which means placing these materials below the active ground water flow zone associated with the upper layer of weathered clay.

The solidified materials and slag will be covered with a 5 m layer of recompacted native clay. The top surface of the cover will be approximately at the original ground surface level.

An underdrain system will be provided, but will not be operated unless leachate control becomes necessary.

Landfill capacity is in the order of 4 000 000 m^3 and will provide an anticipated operating life of up to 37 years at an overall plant capacity of 150 000 t/a and 22 years at an operating capacity of 300 000 t/a (Monenco, C1 and Dillon/Monenco, C9).

e) General Facilities

The undertaking also includes general facilities designed to support the operation of the main treatment and disposal facility components. Included in the general facilities are the following:

- A physical arrangement of the various components of the treatment facilities and support facilities on the site in the Township of West Lincoln.

- Safety and security features including:

  - engineered containment systems at selected locations within the facility to minimize the risk of contaminant pathways from the central operating area to the ground water system;

  - a fire protection system, including specific equipment to be provided and measures to be taken, throughout the facilities;

  - plant security systems to control access to the facilities.

- Waste unloading systems, including bulk waste unloading facilities and truck wash facilities.

- A tank farm and tank storage facilities for the segregated storage of organic and inorganic wastes respectively while they await treatment.

- Facilities for the receipt, sampling, analysis, storage, and processing of organic and inorganic waste delivered to the treatment facility in drums and miscellaneous containers.

- Laboratory facilities designed to enable the determination of the characteristics of the waste proposed for treatment and the definition of guidelines for their shipment, receipt, sampling, analysis, unloading, storage, and treatment. OWMC staff will also use these facilities to conduct tests to ensure that the treatment objectives are being achieved, to recommend procedures to ensure the worker's health and safety, and to undertake environmental monitoring programs.

- A modern data management system for efficient planning, co-ordination, and management of the overall operations of the treatment facility, and process control systems for the control and monitoring of treatment processes and related safety items.

- Electrical distribution systems and associated lighting, communication, and safety systems conforming to the pertinent codes and practices, including the emergency power supply systems that will ensure safe operations during power failure.

- Site servicing, including:

  - Electricity: by an extension from an existing Ontario Hydro line about 3.5 km along Silverdale Road and Highway 20;

  - Sanitary Sewage Treatment: by installing a package treatment plant on-site and discharging treated effluent to a storm sewer that will run along Heaslip Road to the Welland River;

- Storm Water: by providing on-site drainage and perimeter drainage to the Welland River through a Heaslip Road allowance storm sewer about 2 km long;

- Auxiliary Fuel: by natural gas from Vineland through a pipeline running about 17 km along Regional Road 24 and Highway 20;

- Water Supply: by pumping raw water from a pumphouse to be located on the bank of the Welland River within the Heaslip Road allowance, through a buried pipeline along Heaslip Road for about 2 km to a water treatment system to be located on the OWMC site.

The proposed location and alignments of the site services are shown in Figure 2.3. These will be discussed in detail in the Implementation Stage EA.

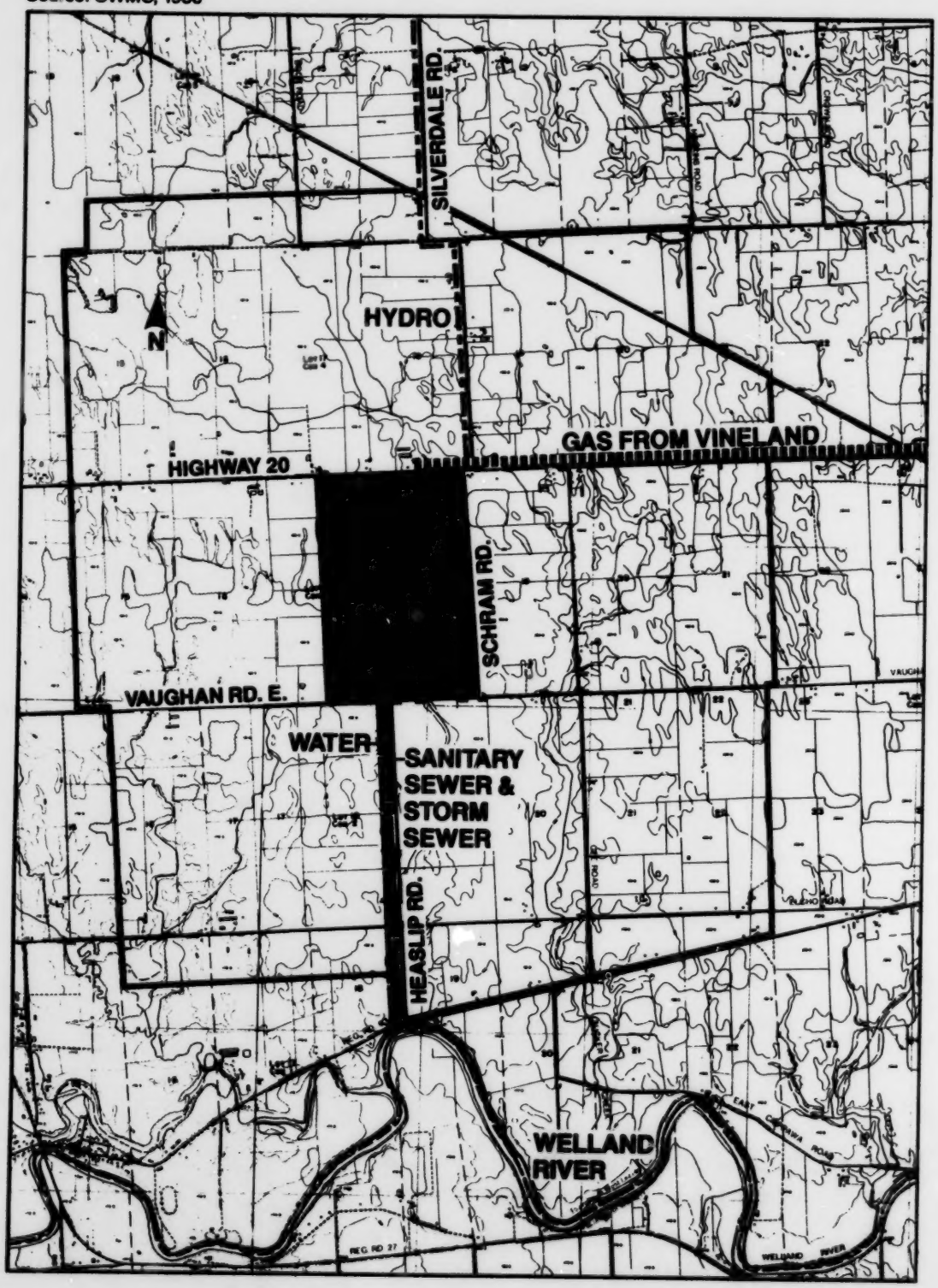
o Utility systems consisting of services will be distributed throughout the site to supply the needs of the process areas and ancillary buildings. These include:

- electricity;
- compressed air;
- steam and condensate systems;
- service water;
- drinking water;
- cooling water; and
- surface drainage systems to segregate and manage uncontaminated, potentially contaminated, and contaminated surface water.

o Vent emission control systems designed to minimize any release of contaminants to the environment from the organic and inorganic treatment systems.

o Buildings and facilities ancillary to, but essential for, the operation of OWMC's facility, including:

Figure 2.3
Site Servicing Proposal
Source: OWMC, 1986



- the administration building, providing accommodation for all on-site administrative functions as well as the main laboratory and data management services;

- the gatehouse, providing accommodation and facilities for security personnel controlling the main entrance and exit from the site and weighing and sampling incoming waste;

- maintenance facilities to provide the necessary space, tools, and materials for on-site maintenance of process equipment and plant vehicles; and

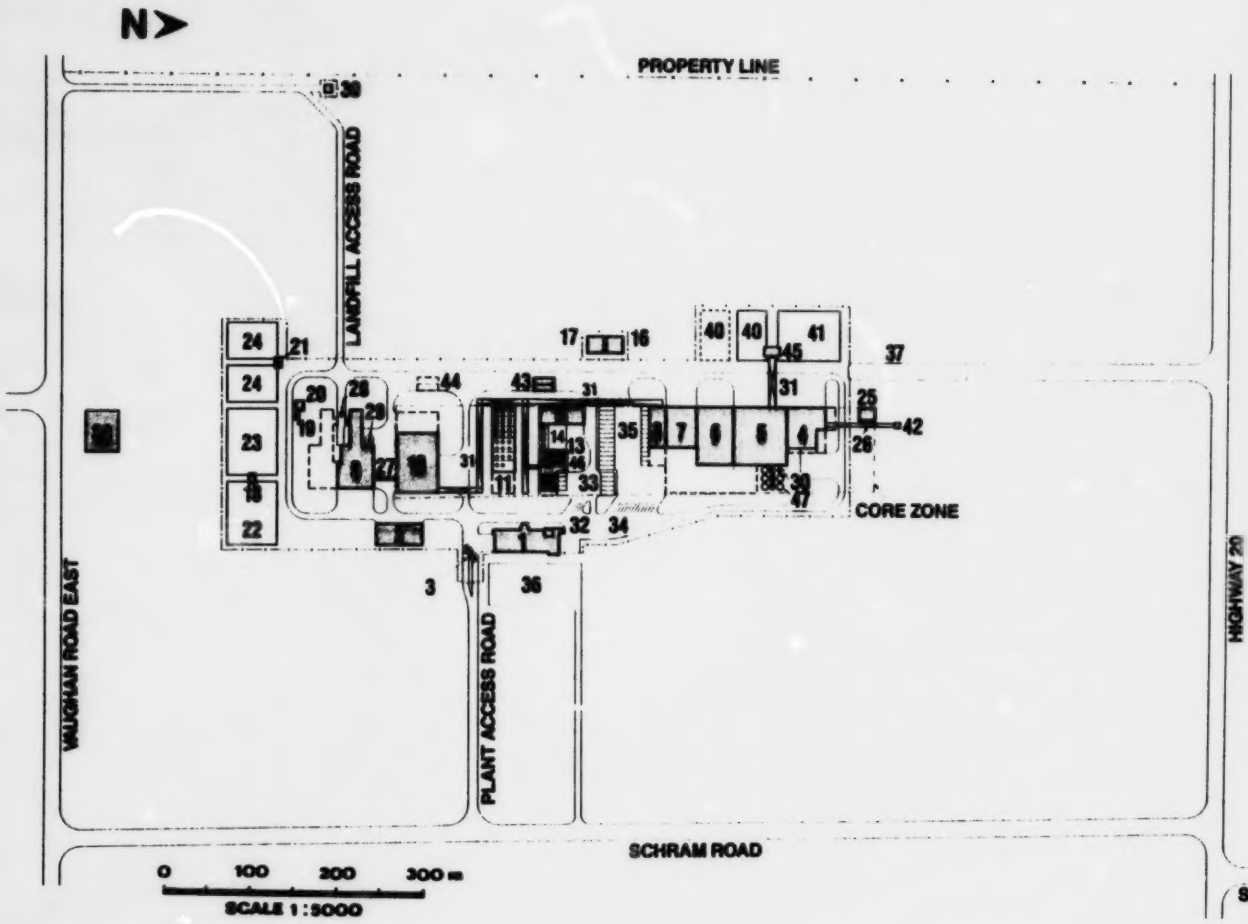
- pipe racks to support and provide access to all waste, process, and utility pipes and cable trays.

Figure 2.4 shows the arrangement of the general facilities and treatment facilities within the central operating area. General facilities are sized to meet the treatment facilities' capacity of 150 000 t/a but can be expanded to accommodate the ultimate capacity of 300 000 t/a with minimal interference with plant operations, if required (Monenco, C1 and Monenco, C10).

3. Market Area

The proposed OWMC facility is designed and sized to handle special wastes from all parts of Ontario, with priority wastes being targeted as discussed in Chapter 5. While OWMC does not intend to market its services in other jurisdictions, its Board of Directors has indicated that its facilities may accept wastes from outside Ontario jurisdictions on a reciprocal basis. Thus, if some Ontario wastes were accepted for appropriate treatment and/or disposal in the United States or other provinces, OWMC would be prepared to consider treating comparable amounts of wastes from those other jurisdictions. This would be subject to the limitations imposed by available treatment and disposal capacity, with first priority being given to Ontario generated wastes.

Figure 2.4
Central Operating Area - Layout
Source: OWMC, 1986



LEGEND

1. ADMINISTRATION BUILDING
2. MAINTENANCE BUILDING
3. GATEHOUSE & WEIGH SCALES
4. SOLIDIFICATION PLANT
5. PHYSICAL / CHEMICAL TREATMENT PLANT
6. PHYSICAL / CHEMICAL STORAGE TANK AREA
7. INORGANIC DRUM STORAGE & HANDLING BUILDING
8. INORGANIC TANK TRUCK UNLOADING AREA
9. INCINERATION PLANT
10. ORGANIC DRUM STORAGE & HANDLING BUILDING
11. INCINERATOR TANK FARM
12. ORGANIC TANK TRUCK UNLOADING AREA
13. INCINERATOR WASTE RECEIVING TANKS
14. SEGREGATED ORGANIC STORAGE TANK AREA
15. STORAGE BUILDING
16. MAIN SUBSTATION
17. EMERGENCY POWER STATION
18. SURFACE WATER PUMPHOUSE
19. SANITARY SEWAGE PLANT
20. RAW WATER TREATMENT PLANT
21. FIREWATER PUMPHOUSE
22. SURFACE WATER POND (POTENTIALLY CONTAMINATED)
23. SURFACE WATER POND (UNCONTAMINATED)
24. FIREWATER POND
25. SOLIDIFIED MATERIAL INTERIM STORAGE BUILDING
26. SOLIDIFIED MATERIAL CONVEYOR
27. DRUM CONVEYOR
28. INCINERATOR STACK
29. AUXILIARY BOILER STACK
30. EVAPORATOR STACK
31. PIPERACK
32. TEMPORARY TRUCK HOLDING AREA (ORGANIC)
33. TRUCK HOLDING AREA (ORGANIC)
34. TEMPORARY TRUCK HOLDING AREA (INORGANIC)
35. TRUCK HOLDING AREA (INORGANIC)
36. CAR PARK
37. EMERGENCY ROAD, HYDRO & GAS CORRIDOR
38. LANDFILL STORM DETENTION POND
39. METEOROLOGICAL / AIR MONITORING STATION
40. RECYCLE WATER POND
41. EVAPORATOR FEED POND
42. TRUCK LOAD OUT STATION
43. TRUCK WASH STATION
44. TRUCK WASH STATION (FUTURE)
45. EVAPORATOR / RECYCLE PUMP HOUSE
46. FUEL OIL TANKS
47. EFFLUENT STORAGE TANKS

4. Waste Management System

The basic elements of the waste management system to be associated with the operation of the OWMC facility are as follows:

- OWMC's main clients will be generators, intermediate treaters, and recyclers of hazardous industrial wastes within Ontario.

- Transportation of these wastes to OWMC's facility is to be arranged with qualified transportation companies from a list that OWMC will establish. The contract between OWMC and its client will specify the preferred access routes for the transporter to use. Transportation will be further controlled and monitored by the waste management manifest system as established by Ontario Regulation 309 as amended by Ontario Regulation 322/85 under the Environmental Protection Act.

- Existing licensed transfer and collection stations may be used as part of the network to bring wastes to OWMC's facility.

- Wastes from spill cleanups and from cleanups at other waste management sites will be handled through similar contracts with the responsible parties.

- OWMC is considering establishing collection and transfer stations in the province, but these are not part of the application.

5. Expansion

Approval is sought for treatment facilities with a capacity of 150 000 t/a with services and a site sized for expansion to an ultimate capacity of 300 000 t/a, if necessary. While all environmental effects of the proposal will be assessed on the basis of 150 000 t/a capacity, sensitivity analyses have been done for some factors on the basis of the ultimate capacity. OWMC is not seeking approval for doubling the facility capacity at this time.

6. Detailed Design

The engineering in this environmental assessment is at a conceptual design stage. Approval is sought for necessary modifications consistent in principle with the approved undertaking to be made during the detailed design stage, subject to the concurrence of the Director of Environmental Approvals, Ministry of the Environment.

7. Operation, Maintenance, and Replacement

The undertaking for which approval is sought includes operation, maintenance, and replacement of the approved facilities subject to the provisions of the Environmental Protection Act for such activities.

8. Retirement and Decommissioning

OWMC is proposing no fixed lifetime for the treatment facilities, as they will be continually maintained and upgraded. The same holds true for the general facilities supporting the main treatment process areas.

For the landfill, OWMC is proposing a site closure and long term care and monitoring program (Monenco, C1 and Dillon/Monenco, C9).

9. Further Detail

The undertaking is described in greater detail in both this document and the supporting documents, all of which form part of this environmental assessment.

Chapter 3:
The Special Waste Problem in Ontario

Chapter 3:
The Special Waste Problem in Ontario

This chapter describes the nature of the problem created by special waste. In relation to the Environmental Assessment Act's requirements, this chapter provides a description of the environmental setting within which conceptual alternatives are evaluated in Chapter 4.

A. DEFINING SPECIAL WASTE

Human activity generates many forms of waste. Technological society produces wastes that are either different from those that cycle in natural systems, or too great in volume to be assimilated by natural systems.

These wastes may be generated by any sector of society, including residential, commercial, institutional and industrial, and they may be solids, liquids or gases. Some of these wastes, such as sanitary sewage and non-hazardous residential garbage, can be returned to the environment under controlled conditions without creating adverse effects; municipal landfills and sewage treatment plants are intended to do this. Industrial wastewater and air emissions, once they have had the contaminants removed, can also be dispersed to the environment through effluent discharges (including sewage treatment systems) or air emissions dispersion. The contaminants removed from the wastewaters and air emissions, however, often become treatment residuals which must be classified as "special waste".

OWMC identifies those wastes or treatment residuals that cannot be released directly to the environment, even using conventional municipal waste management facilities (landfills, incinerators, or sewage treatment plants) as special waste.

B. ONTARIO'S SPECIAL WASTE

A number of consultants have assisted OWMC in assembling information on the characteristics, quantities and distribution of special waste generated in Ontario. These studies support the conclusion that the province's manufacturing sectors produce significant quantities of special waste and that some of this waste is going to inappropriate destinations.

Following a study completed by Proctor and Redfern Ltd. in 1982, The Waste Quantities Study (P&R, B1), OWMC asked Canviro Consultants Ltd. (Canviro) to undertake a survey of Ontario industry [Market Assessment Program/Survey of 1000 Industrial Establishments, 1985 (Canviro, B2)]. The data Canviro collected from 1000 establishments has provided valuable planning information and have been the basis of additional extrapolations done for OWMC by DPA Group Inc. [Market Assessment Program/Special Waste Generation by Ontario's Manufacturing Industry in 1983, 1986 (DPA, B3)].

Several points should be made about these estimates of waste quantities. First, OWMC's definition of special waste is more comprehensive than the definitions that appeared in legislation at the time OWMC began its planning. The reason for this is that OWMC's treatment facilities probably will not become operational before the 1990s. Planning for these facilities must therefore anticipate future environmental standards, rather than present ones.

Second, waste estimates vary depending on the definitions and methodologies used. Despite these differences, Table 3.1 shows that three major industrial waste quantity studies have given similar results. A discussion of the various estimates can be found in Market Assessment Program/Estimating Waste Quantities by the Ontario Research Foundation 1985 (ORF, B4).

Finally, the estimates shown in Table 3.1 are representative of the Ontario manufacturing sector only. They do not include special waste from commercial establishments, the service industry, institutions or households. They also do not include waste from hospitals or spills and

Table 3.1
Estimates of Waste Generation in Ontario
Source: Proctor & Redfern (B1), DPA (B3), Ontario Research Foundation (B4)

STUDY	TONNES PER ANNUM (t/a)
Proctor & Redfern Ltd.	1,490,300 (1981)
Gore and Storrie	1,605,107 (1980)
Canviro/DPA	1,135,129 (1983)

site clean-ups. These other sources could generate significant additional quantities of special waste, although no published estimates are available.

OWMC and its consultants looked at several aspects of the waste generated in Ontario:

1) the characteristics of the waste;
2) the distribution of waste;
3) the destination of waste.

1. The Characteristics of Waste

There is great variety in the characteristics of waste generated by industry in Ontario. This variety results from the use of different raw materials, different production processes, and different operating procedures. For planning purposes, a simple extrapolation of the waste generation sample can be used to divide the waste into basic chemical and physical characteristics.[1] Applying these percentage factors to the most recent generation estimate of 1.1 million tonnes begins to put the market into perspective, (Table 3.2).

For more detailed analyses, OWMC used a finer categorization based on a waste classification system developed at the University of California at Davis (UCD). This finer breakdown was used in technical reports supporting this document [Facility Development Process, Phase 1 - OWMC, 1982 (D1); P&R, (B1); Canviro, (B2); and DPA Group, (B3)].

[1] In fact, most wastes contain both organic and inorganic components; these contaminants are often what makes waste waste, rather than product.

Table 3.2
Physical and Chemical Characteristics of Waste in 1983
Source: OWMC, 1986

	INORGANIC SPECIAL WASTES	ORGANIC SPECIAL WASTES	TOTAL
Solids	27%	6%	33%
Liquids	30%	27%	57%
Sludges	6%	4%	10%
Total	63%	37%	100%

2. Waste Distribution

There are a number of ways to describe the distribution of waste generation, each of which provides a different perspective on the problem. These include:

- o by geographic distribution;
- o by industry distribution;
- o by industry size.

Geographic Distribution - Special waste is generated throughout the province, but its distribution closely parallels the geographic distribution of industry. Over 60 percent of the special waste generated is generated in the highly industrialized part of Southern Ontario surrounding the western end of Lake Ontario. In contrast, the northern and southeastern parts of Ontario, where industrial centres are smaller and more widely disbursed, contributed only 3 percent and 5 percent, respectively, while the southwest portion of the province generates an estimated 27 percent.

Industry Distribution - Almost 50 percent of special waste is generated by two industry types - the primary metal and chemical industries. Ninety percent is generated by the top eight industry types.

Distribution by Size of Establishment - Over 50 percent of Ontario's special waste is generated by 1,194 establishments that have 100 employees or more. However, it is the more than 12,000 smaller companies with 50 or fewer employees that produce about 28 percent of the waste which present the more difficult waste management problems. These smaller firms are often unable to treat their waste on-site because of diseconomies of scale, and they may also lack the technical expertise and capital to match their waste problems with the best management systems, unlike large firms which do have such resources.

3. Destinations of Special Waste

The environmental effect of a special waste is closely linked to the way in which a generator disposes of it. Special wastes by definition require special management, but the generator may have several options from which to choose. A number of factors can influence his choice: legislation/enforcement and economics are the most important.

These and other factors influence a generator in his choice of waste management options (see Chapter 5 for a discussion of their influence on the waste management market). These options can be divided into two broad groups; on-site and off-site.

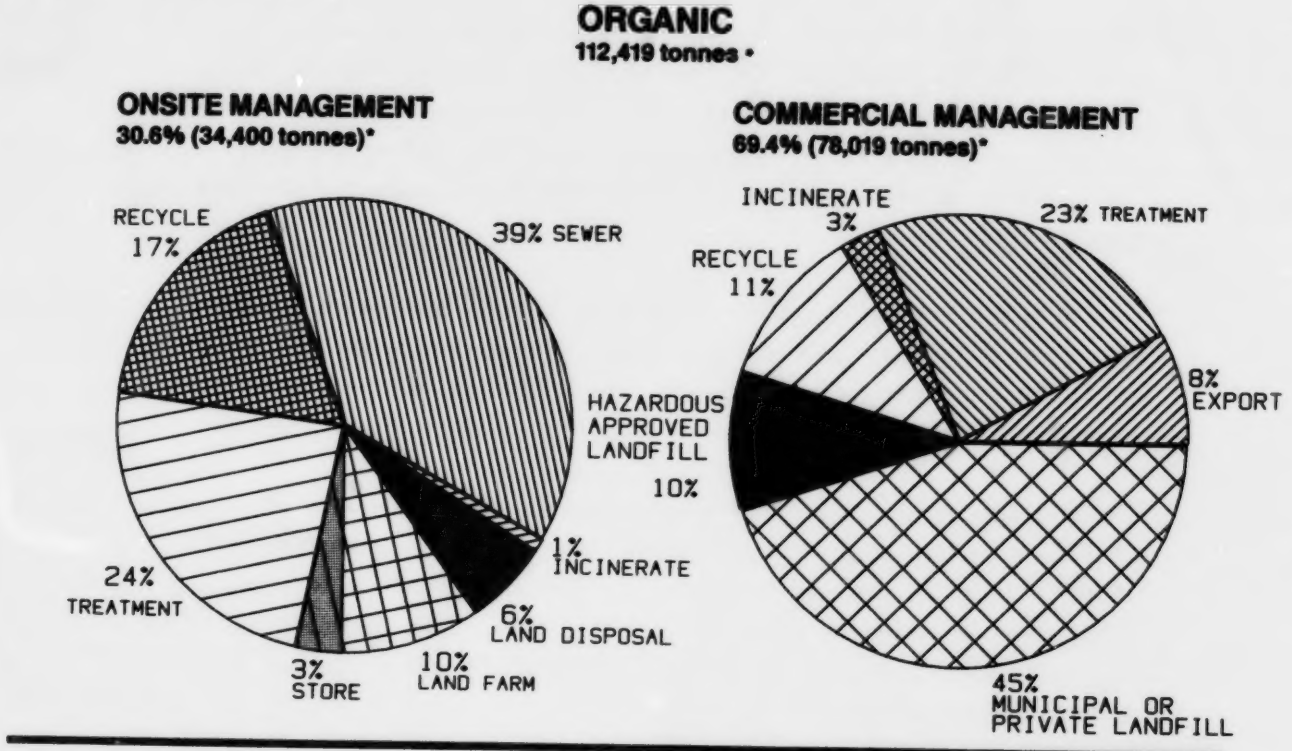
On-site options include various treatment and disposal processes, including biological treatment, physical and chemical processes, landfill, land farming, recycling and solidification. Some wastes (PCBs are an example) are now stored on-site. Also included in the on-site category are the significant quantities of waste discharged into the sewer system.

Off-site waste management options include: commercial waste management firms, recyclers/reclaimers/re-users, municipal landfills, and export to other jurisdictions. The most important commercial treatment and disposal firm in Ontario is Tricil Limited.

The distribution of Canviro's survey sample allocated to the various waste management options is shown in Figure 3.1. Although this is only a portion of the special waste generated in Ontario, it is a relatively large portion, and indicates the types of disposal choices presently used in the province (Canviro, B2).

The Figure shows that a significant percentage of waste managed on-site goes to the sewers. An even greater total percentage of waste moved off-site goes to landfills or is exported. These destinations can lead to the release of emissions or effluents to air, land or water in a form or a quantity that have the potential to affect adversely the natural environment or human health.

Figure 3.1
Disposal of Organic and Inorganic Special Waste in Ontario
Source: OWMC, 1986



*Allocation of wastes sampled in the survey of 1000 companies to treatment and disposal alternatives.

C. EFFECTS OF SPECIAL WASTE

While not all contaminants in the environment come from special waste, OWMC has concluded that contaminants from this source do affect the Ontario environment adversely.

The effects contaminants present in special waste have on humans are discussed in Human Health and Special Waste by Environ Corporation, 1986 (B6), pp.8-17. The effects of toxic chemicals on birds, mammals and fish present in the Ontario environment are discussed in Environmental Effects of Special Waste by ELI Ecologic, (B5), Chapter 3.

The effects of toxic chemicals on humans or the environment are determined by the exposure of an individual or the environment to the contaminant in question. In humans, in addition to the duration of exposure, the effect is a function of five factors (Environ, (B6), p.3):

- toxicity;
- dose;
- route of entry;
- interaction between the chemical and other concurrent chemical exposures;
- the normal protective and restorative mechanisms of the body.

These factors are also relevant to plants and animals.

In the case of humans and other mammals, exposure to toxic chemicals can involve impacts on any body function or organ system. The nature of the effects depends on: the specific chemicals contacted; the extent of exposure; the characteristics of the exposed individual (species, age, sex, genetic background); and other factors. Health effects of primary concern to human populations exposed to such chemicals include organ damage, cancer, genetic defects, reproductive

abnormalities, immunological imbalances, nervous system disorders, and adverse impacts to the blood and skin (Environ (B6), p.8).

Plants may also exhibit a range of effects including damage or death. In the case of cultivated plants, this damage may mean reduced economic value due to reduced yield or visible damage. Also, while there may be no apparent damage to the plant, absorbed contaminants can be passed along to humans or other animals in their food.

The potential danger of industrial waste is clearly recognized in Parts V, VII and IX of the Environmental Protection Act, Regulations 308 and 309, sewer use by-laws and the Water Resources Act requirements which regulate and control waste. These are based on scientific studies which show the effects of particular contaminants on the environment.

OWMC commissioned a review of the environmental effects associated with toxic chemicals in the environment, including those that originate from current waste management practises (ELI, Ecologic, B5). This review found:

- Since 1980, although many localized trends of environmental contaminants continue to show a decline, widespread trends, such as those measuring trends of certain environmental contaminants over the whole of Lake Ontario, have become stationary, while others show an increase.

- Both the increases, and the slowly declining trends, are evidence of continuing environmental sources of persistent chemicals derived from special waste. Some of these chemicals are entering the Ontario ecosystem at a rate which exceeds the rate at which they are being removed from circulation.

- Population-level effects, such as reproductive failure, increased incidence of congenital anomalies and abnormal behaviour in wild omnivorous or carnivorous birds of Ontario, reproductive failures of mammals, such as mink, and increased incidence of fish tumours, have been documented since the 1960s.

- Although the widespread gross population effects, such as the almost total reproductive failure of herring gulls, cormorants and herons in Lake Ontario, ceased in 1977, other more subtle effects, such as liver enzyme dysfunction, and elevated incidence of fish tumours continue to be found in localized areas of the Great Lakes.

- Effects on the population levels of wild species represent serious problems from toxic chemical exposure since documented cause-effect relationships show long lag phases of more than ten years duration between the chemical exposure and the population damage and between the decline of exposure and the improvement within the population. Therefore, population-level effects in wild species caused by toxic chemicals represent serious problems since the effect may last for over ten years after the cause has been removed.

- The effects demonstrated in Ontario wildlife represent irreversible or terminal damage to the individuals within each species studied. Those effects, such as total reproductive failure, would be considered totally unacceptable if they were demonstrated in humans in Ontario -- especially if cause-effect relationships could be established in humans.

The study concluded that environmental exposure to persistent toxic chemicals derived from special waste is currently damaging wildlife and potentially damaging humans in Ontario, and that the most logical scientifically based course of action is to prevent and anticipate toxic chemical problems before they are proven to be occurring. For the special waste that society must create, this requires the best treatment available.

Similar conclusions resulted from a workshop organized, at the request of OWMC, by the Institute for Environmental Studies at the University of Toronto on March 7 and 8, 1986.

The 12 papers presented at the workshop by 18 Canadian scientists and experts have been published by IES under the title: "Hazardous Contaminants in Ontario: Health and Environmental Effects" edited by T.C. Hutchison and S.W. Evans, 1985, (IES).

Although all scientists emphasized the difficulty in demonstrating cause-effect relationships, there was general agreement that although more study was needed, actions to reduce impacts should not be deferred until the results of the studies are available. Studies completed already provide cause for concern:

- In the Niagara River, contamination by toxic chemicals occurs in all components of the ecosystem including water, biota, suspended sediments and bottom sediments.

- The variety and composition of wastes discharged to sanitary sewer systems has outstripped the capability of simple biological degradation for which these plants were designed.

- Discharges of certain compounds (hexachlorobenzene, phenanthrene) are discharged from sewage treatment plants in concentrations estimated to produce sublethal effects in fish within the mixing zone of the effluent.

- It is reasonable to assume that excessive concentrations of various persistent toxic chemicals have had significant effects on the health of Great Lakes aquatic populations.

- Epidemiological evidence, while suffering from some complicating factors, is very good for the chemical induction of neoplasia in many fish populations.

The editors of the Proceedings commented:

> "The presentations which were made at the Toronto Workshop demonstrated, for a large number of toxic chemicals and for a wide variety of locations and monitoring sites, that significant release of hazardous wastes has and is taking place into the Ontario environment... While effects on wildlife were felt to be clearly demonstrated, the evidence of substantial human health effects was not so clear. However, without proper safe disposal of hazardous wastes, this situation was considered bound to change in an unfavourable direction... It was felt that it was more prudent, economic and morally responsible to ensure to the best of our ability that hazardous wastes be treated in such a way that risks to people and biota be minimized" (IES, p.1-2).

OWMC also commissioned a study to identify the human health effects that may be associated with exposure to special wastes (Environ, B6). The main findings of the study include the following:

- exposure to contaminants present in special wastes may result in a variety of adverse human health effects;

- despite limitations, various methods can be used to assess human health impacts associated with exposure to environmental contamination from chemicals released from disposal sites;

- case studies from Hamilton, Ontario; Love Canal, New York; and Hardeman County, Tennessee have indicated that the improper disposal of special wastes can lead to a variety of health effects in exposed populations.

The conclusion of the study was that there exists a need to establish waste management facilities that minimize the release of special waste to the environment and therefore reduce the potential for human exposure to such waste.

The conclusions of these three documents on the need for better treatment technology is also supported by major environmental and policy documents relating to special waste problems, including:

- International Joint Commission, 1986. Report of the Committee for the Assessment of Human Health Effects of Great Lakes Water Quality.

- U.S. National Academy of Science, Royal Society of Canada 1985. Review of the Great Lakes Water Quality Agreement.

- Office of the Governor, Michigan, 1986. World Large Lakes Conference, Focus on Toxic Chemicals.

Although epidemiologists cannot always prove a direct relationship between improperly disposed of chemicals and adverse effects, this failure, due to data problems and current methodological limitations on

the science of human toxicology, is not evidence in itself that chemical exposure does not produce adverse health effects.

However, one thing is certain; no reputable scientist has ever suggested that our exposure to such contaminants will be beneficial to us. The overwhelming weight of scientific opinion is that we should be deeply concerned at widespread environmental contamination, and make every effort to reduce it and to prevent it in the future.

Conclusion

There is a special waste problem in Ontario. The threat to the environment represented by the contaminants released from special wastes is a serious one, which requires the attention of all those involved in waste management. Legislation can play an important role, but better treatment and disposal practices are dependent on the availability of appropriate waste management programs. OWMC was created to make a contribution towards solving the problem outlined in this chapter.

Chapter 4:
Alternatives to the Undertaking

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Alternatives to the Undertaking

The previous chapter concluded that a large amount of special waste is produced in Ontario, that a significant portion is not being treated by appropriate technologies, and that better control and treatment of these wastes will help to protect human health and the environment.

This chapter outlines the broad, conceptual alternatives that OWMC examined in the course of concluding that the proposed undertaking is a sound and necessary initiative that can play an important role in helping to solve Ontario's special waste problems.

The EA Act distinguishes between "alternatives to the undertaking" and "alternative methods of carrying out the undertaking". This chapter deals with "alternatives to", which is defined as options that differ fundamentally from OWMC's proposal for centralized treatment and disposal facilities.

Before coming under the EA Act on 12 July 1985, OWMC already had concluded that it needed facilities of its own, comprising a physical/chemical treatment plant, an incinerator, a solidification plant, and an engineered landfill. In fact, this concept was inherent in OWMC's mandate as defined by the OWMC Act and by statements in the Legislature by the then Minister of the Environment, The Honourable Harry Parrott. Prior to July, 1985, OWMC had come close to deciding that facilities should be built together, not separately in different places, and to choosing one or more preferred sites. However, it had resolved to continue to consider any credible alternatives that emerged during the Facilities Development Process and the accompanying public consultation program. With this in mind OWMC retained; Arthur D. Little International Ltd., to survey such alternatives [Hazardous Waste Management Options for Ontario 1986 (ADL, B7)]. In addition, OWMC

has itself conducted reviews of alternatives to the undertaking and this work is reflected in this chapter.

Section A of this chapter outlines the process of identifying conceptual alternatives to be evaluated; Section B describes the criteria and methods used to evaluate the various alternatives; and Section C describes the alternatives considered and discusses the results of applying the criteria. Section D then summarizes the main findings and conclusions.

The requirements of the EA Act for evaluating alternatives to the undertaking are met as follows:

- o the environment potentially affected is described in Chapter 3;
- o environmental effects are considered first in establishing and then in applying evaluation criteria in Sections B and C;
- o mitigation and remedial action are considered in Section A, where the weaknesses of the stand alone alternatives are mitigated by identifying more promising combination options; and
- o evaluation of net advantages and disadvantages to the environment begins in Section C and ends in Section D.

A. EXAMINING CONCEPTUAL ALTERNATIVES

Out of the many theoretical possibilities, OWMC chose a limited number of practical alternatives meriting detailed consideration. It did this in four steps:

1. It identified a preliminary list of conceptual alternatives for consideration.
2. It rejected courses of action that were unacceptable in principle.

3. It mitigated weaknesses detected in remaining stand alone options by combining them with other alternatives.

4. It chose conceptual combination alternatives for further analysis.

These four steps are described below:

1. Identifying Alternatives for Consideration

OWMC identified a preliminary set of alternatives for evaluation:

1. taking no action: the 'do nothing' alternative,
2. sending all wastes out of the province untreated,
3. indefinite or perpetual storage without treatment,
4. greater encouragement of the "four Rs", with no other action,
5. enhanced treatment and disposal at source,
6. enhanced private treatment and disposal off-site, and
7. decentralized public facilities.

2. Alternatives Rejected in Principle

Of these seven alternatives, OWMC rejected the first three as inconsistent with both its own mandate and established government policy, under which Ontario must take responsibility for dealing properly with its own special wastes.

a) Taking no action is the no-change alternative described as the base case by the General Guidelines for the Preparation of Environmental Assessments, Ministry of the Environment, (revised 1982).

In fact, as discussed in Chapter 3, this alternative simply will not solve the environmental problems caused by special wastes.

b) Sending all wastes out of Ontario untreated would transfer Ontario's problem to other jurisdictions and would leave the province vulnerable to policy changes elsewhere. The trend in the United States is to restrict the movement of waste and to set

more stringent requirements for their treatment and disposal. Faced with the need to treat their own wastes properly, U.S. jurisdictions will likely become more and more reluctant to make their limited capacity available to others. In the long run, other Canadian provinces will probably face the same problem and take the same attitude.

c) Indefinite storage, in warehouses, tank farms or some equivalent, assumes that either future technological developments will make it possible to recover useful materials from what are now useless wastes, or better disposal methods will some day be found. Perpetual storage, in geologic isolation, implies that the best thing to do with special wastes is to isolate them as far as possible from the general environment without trying to destroy or reduce their toxicity first.

OWMC considers this an inappropriate way of dealing with all special waste. To accumulate the volumes of such waste currently being produced in Ontario, without maximum treatment now, would pass on an unfair burden to future generations. Storing large amounts of untreated special waste poses a risk of disastrous damage to human health and the environment if the storage facility were ever broached. OWMC would consider this solution only for relatively small amounts of wastes or residues that could not safely be disposed of in any other way, or for which acceptable treatment technologies are not yet available.

All of the remaining alternatives (except "No Action") are based on two key assumptions. One is that new regulatory initiatives would be developed, and that these initiatives would depend to some extent on the quality and capacity of available treatment/disposal facilities. OWMC's understanding is that MOE is more likely to revise standards or create greater controls as facilities become available, rather than in anticipation of such facilities. The second assumption is that a Four R (reduction, recycling, reuse, recovery) program would be pursued vigorously.

3. Mitigation of Remaining Alternatives

After rejecting these alternatives for the reasons given above, OWMC found that some of the remaining four were not mutually exclusive, while others that were weak on their own could be combined into a stronger overall concept. This process of mitigating the weaknesses of particular alternatives and developing combination options is discussed in ADL, (B7), Chapter 2. The effects discussed in Section C of this chapter of the EA are the net effects allowing for this mitigation.

4. Conceptual Alternatives Chosen for Analysis

The following alternatives were chosen for further evaluation:

a) a 4R program only, operated by OWMC,
b) an OWMC 4R program together with active support for private waste treaters,
c) partial OWMC facilities, supplemented by private enterprise,
d) mobile OWMC facilities, and
e) dispersed but fixed OWMC facilities.

These are discussed and evaluated in Section C where the OWMC proposal and the no-action alternative are taken as the bases for comparison.

B. EVALUATION CRITERIA AND METHOD

Acceptable options must be able to deal with Ontario's special waste effectively and safely, be technically feasible, and meet all applicable laws and regulations in Ontario and other affected jurisdictions. The criteria used to evaluate the conceptual alternatives to the undertaking were matched with OWMC's three primary goals, namely:

- o to minimize risk to human health;
- o to minimize environmental impact;
- o to minimize cost to OWMC and to the people of Ontario.

The options were evaluated against two questions: Is there any alternative that presents a lower risk to human health and less impact on the environment at a lower cost? And, if not, what are the tradeoffs between the alternatives?

1. Evaluation Criteria

The criteria developed to evaluate the alternatives were grouped into two general categories pertaining to waste management planning, taking into account the definition of "environment" found in the Environmental Assessment Act. They are outlined in Table 4.1.

2. Evaluation Method

Each conceptual alternative was evaluated against OWMC's undertaking, and against taking no action, in four steps:

1) Weighting factors were assigned to each criterion and a preliminary ranking established.

2) The conceptual alternatives were rated qualitatively against OWMC's undertaking for each criterion.

3) Principal tradeoffs between the alternatives were identified.

4) The alternatives were ranked in order of preference.

Detail on the evaluation method is found in Chapter 4 and Appendices B and C of ADL (B7). The results are discussed below.

Table 4.1
Criteria Used to Evaluate Conceptual Alternatives
Source: A.D. Little (B7)

A. CAPABILITY TO SOLVE ONTARIO'S SPECIAL WASTE MANAGEMENT PROBLEMS

- **Capabilities**
  - availability of sufficient treatment capacity
  - adaptability to future needs of waste generators
  - ability to deal safely with all types of special waste produced in Ontario
  - operating and performance standards
  - ability to provide cost effective service
- **Provincial Control**
  - ease of implementation
  - adherence and enforcement of standards, including the setting of procedures and monitoring
  - timeframe for capacity development
  - assurance of long-term availability of capacity.

B. EFFECTS ON HEALTH AND SAFETY, THE ENVIRONMENT, AND COSTS

- **Health and Safety Effects**
  - community health and safety
  - transport
  - worker health and safety
- **Environmental Impacts**
  - community life
  - economy of local community
  - private waste management industry
- **Costs**
  - need for public capital
  - costs to waste generators

C. EVALUATION OF ALTERNATIVES TO THE UNDERTAKING

The following options were considered as reasonable alternatives to the undertaking. Mitigative measures were incorporated in their development, so that the analysis is of net effects.

1. Four R Program Only, Operated by OWMC

Description

This alternative assumes that OWMC would continue and expand its present 4R program in cooperation with others. The government, however, would establish and enforce more stringent regulations for treating and disposing of special waste. This presumably would increase the demand for treatment facilities, but it would rest with the private sector to meet that demand.

A 4R program involves providing waste generators with information, technical expertise, and perhaps financial incentives to enhance reduction, re-use, recycling, and recovery. Note that while reduction by definition can take place only at the generator's plant, the other three Rs can be carried on there or elsewhere. It is assumed that OWMC would involve itself in all four activities.

Evaluation

This alternative would entail no large capital investment of public funds, and might also be cheaper to run than OWMC's proposals. However, this assumes that private treaters would serve generators at lower cost than a Crown agency, which could be offset by the economies of scale that the latter would enjoy. Assuming that private enterprise provided treatment using appropriate technologies for all wastes that should be treated, it would benefit from the increased demand.

Transportation risks would be much the same as with OWMC's proposal, because the stricter regulations would send roughly equivalent volumes of wastes to private off-site facilities.

A 4R program alone, however, cannot deal adequately with all Ontario's special waste. The 4Rs cannot eliminate all such wastes and tend to produce their own residual streams, which in turn can be concentrated and require further treatment and disposal. Many medium sized and small generators lack the physical capacity for a proper 4R program. A recent U.S. study promoting the 4Rs acknowledged that, "waste reduction, no matter how far it is taken, cannot eliminate all wastes..." (Serious Reduction of Hazardous Waste, Office of Technology Assessment, U.S. Congress, 1986) (p.3). Wastes not amenable to the 4Rs would still be generated, and under this alternative they could be overlooked or not properly monitored or controlled. An attempt to deal with all waste on-site complicates the problem of meeting uniform standards, and enforcement. These considerations make this an inferior solution to the proposal.

2. **Four-R Program With Active Support for Private Waste Treaters**

Description

As in Alternative 1, OWMC would run no facility of its own. Besides promoting the 4Rs it would take other measures to encourage private enterprise to solve the waste problem. Among these might be:

a) Joint ventures, which could involve facilities owned by OWMC but run by private operators. OWMC would take part equity, or create partnerships with private treatment and disposal firms, generators, and providers of treatment and disposal services on-site.

b) Financial aid: that is, subsidies, low-interest loans, or guarantees for generators to use in buying equipment for treatment and disposal on-site.

c) Financial and technical help from OWMC for private treaters wishing to acquire sites and gain regulatory approval.

d) A management contract or franchise by OWMC with the private sector for ownership and operation of facilities in accordance with specified performance standards.

e) Other forms of support, such as promotion or support of private ventures, and negotiation with facilities outside the province.

Evaluation

Private responsibility for special waste management would create about the same number of jobs as OWMC's proposal, since the same demand would have to be met. Transport risks would vary between options; if the commercial waste management sector established its own facilities, the risks would be much the same as under OWMC's proposal. Workers' health and safety would be as well protected as under the proposal, since private treaters would be subject to the same regulations.

Multiple privately owned facilities obviously could affect more communities than a single publicly owned one, and would entail a correspondingly greater potential risk to human health and safety. Enforcing environmental standards, other safeguards and monitoring programs at a large number of sites would be somewhat more difficult and more expensive.

An important feature of some of these alternatives is that they require that generators take greater responsibility for treating their wastes where they produce them. OWMC estimates that there are some 15,000 waste generators in Ontario, mostly medium and small sized firms. Even with active support from OWMC, on-site treatment presents many problems. Many of the smaller generators lack the necessary capital, expertise, and technical flexibility to install proper treatment facilities, nor could they be expected to treat their own residues on site. Monitoring and enforcing standards at almost

15,000 different locations would be difficult and require a much more extensive and costly system than now exists.

The greatest disadvantage of a number of these alternatives is their dependence on the private sector's willingness to build and operate comprehensive treatment and disposal facilities that would include the best available technology. Private investment requires a reasonable return on the money invested. In the waste management business this puts a priority on building facilities that can meet environmental standards with a minimal capital investment. Wastes which require high cost equipment or expensive operating procedures would be excluded in favour of large volume wastes, with relatively simple and inexpensive treatment. In fact, Ontario's present waste management industry reflects this economic reality.

Even if OWMC or the government attempted to offset some of these economic difficulties, the private sector would still face significant barriers. Public apprehension with respect to hazardous waste facilities imposes special approval mechanisms that entail significant costs. The EA Act involves high initial costs for site selection, environmental assessment studies, public consultation, and legal and hearings costs. These latter costs can include up front payments to the public to support their preparations for the hearings.

Although the public may distrust government, it also distrusts the private sector's willingness to put environmental concerns before the profit motive. Linked to this concern is an awareness that a private corporation's liability is limited by law, while the public sector can offer the continuity and security of public funding. This is particularly important when the public's concern centres on long term environmental damage or post-closure maintenance and monitoring. Generators also have an interest in effective reduction of their liability at a reasonable cost and may prefer the stability and security of government operated facilities.

The special waste management problem has resulted in an increasing government involvement in many jurisdictions for all of the reasons cited above. In Western Europe, public ownership on one model or

another is found in Denmark, France, Sweden, Finland, Norway, and West Germany. In Ontario there are a number of precedents for a government role in providing socially necessary services: Ontario Hydro, and municipal water treatment and sewage treatment are examples of public utilities that have proven successful departures from the normal preference for private investment.

For all these reasons, OWMC judged these alternatives as inadequate solutions to the waste problem.

3. **Partial OWMC Facilities**

Description

OWMC's proposal involves three main components: treatment of organic wastes; treatment of inorganic wastes, including the solidification of residues; and the disposal of treated residues. A combined conceptual alternative would be for OWMC to build only part of the facility, while leaving the private sector to provide the rest in response to market demand. Of the many possibilities within this option, OWMC chose to examine three alternatives as being the most reasonable:

a) OWMC would build treatment facilities for both organic and inorganic wastes, with private enterprise providing for the disposal of the treated residues. Associated functions such as laboratory analyses would be handled at OWMC's facility.

b) The OWMC facility would treat only organic wastes, with private enterprise treating inorganic wastes and disposing of treated residues from both classes.

c) OWMC would treat organic wastes, and solidify and dispose of the residues, leaving private enterprise to deal with inorganic wastes.

Evaluation

These alternatives would entail lower initial investment by the public than OWMC's proposal; if OWMC did not provide one or more components, the need for a public investment would be reduced accordingly. Assigning private industry more waste management business presumably would increase its earnings, since the services provided would have to be paid for by either the generators or the public.

Practical risks would be much the same as for OWMC's proposal. Transportation risks might be greater than for OWMC's proposal, because existing capacity to treat inorganic wastes is located in the Province of Quebec, and many Ontario wastes would have to be sent significant distances to reach it. If new treatment facilities for inorganic wastes were built in Ontario, transportation risks would be reduced accordingly.

In addition, inorganic and organic wastes are often combined in special wastes and would therefore have to be treated by both inorganic and organic facilities; to separate such facilities would be less efficient than integrating them on a single site.

As with the previous set of alternatives, a key issue in evaluating these alternatives is public versus private ownership and responsibility. The same difficulties of public concerns, unfavourable economics, fears of instability or lack of coverage of liability would be applicable, although perhaps on a somewhat reduced basis. OWMC considers all of the alternatives in this section inferior to its own proposal, although it does not rule out the possibility of joint ventures and other arrangements with the private sector in the future.

4. Mobile OWMC Facilities

Description

Mobile facilities take the treatment technology to the waste, rather than bringing the waste to the technology. Mobile treatment and incineration facilities can deal with both organic and inorganic wastes.

Evaluation

Technologies available for mobile facilities can deal with a broad array of special wastes, and new technologies are currently being developed. These new technologies, however, are neither commercially available nor proven in a commercial setting similar to Ontario.

If mobile facilities were to be located permanently at a generating facility, they would then become fixed facilities and would be subject to thorough environmental assessment and approval requirements. Not all generating site locations would be likely to meet rigorous standards for air quality conditions and other natural features.

If mobile facilities moved from community to community rather than from generating plant to generating plant, similar siting issues would be involved in addition to site preparation, time, and costs.

Mobile facilities would have limited treatment capacity and would not be able to provide all of the environmental safeguards that a fixed facility could provide. In addition, mobile facilities would not be able to enjoy economies of scale of large fixed facilities such as OWMC's proposal and therefore for comparable capabilities and environmental safeguards the costs of treatment would be higher.

Many treatment procedures at fixed facilities involve multiple processes. In addition, many waste streams are complex and involve both organic and inorganic substances. Effective treatment, therefore, would require an array of treatment procedures involving

both physical and chemical processes, and the disposal of residues after solidification in a final landfill. No single mobile facility can provide this level of treatment. Also, mobile facilities produce effluent and residues which must be treated and disposed of off-site.

Finally, if there were many mobile facilities, they would require greatly increased government monitoring and inspection with attendant costs. A fixed centralized facility such as proposed by OWMC will minimize such a need. The environmental effects of mobile facilities would depend on how often they were moved and how long they remained on-site. While mobile technologies on-site would have only a marginal effect on community life, actual costs along with risks and impacts could only be determined over several years of operation at different locations.

For all of these reasons, the development of mobile facilities by OWMC or by others is not considered an effective answer to the hazardous waste problem on its own. Mobile facilities may be considered appropriate, however, for specific streams of special waste and contaminated site clean-ups and, therefore, this alternative is viewed by OWMC as a potential supplementary waste management option.

5. **Dispersed, But Fixed OWMC Facilities**

Description

This option involves varying types and combinations of facilities, all owned and operated by OWMC, but dispersed rather than centralized. Using dispersed facilities, an attempt would be made to match specific facility components with concentrated volumes of appropriate regional wastes in order to reduce transportation costs and risks. OWMC evaluated four such alternatives, which are described below.

Option A) OWMC would have two separately located, comprehensive facilities. Each would have the same main components as OWMC's proposal, but with a smaller capacity. One would have a full-scale laboratory for determining waste

characterization, acceptance, and treatability; the other would have only a screening laboratory for verifying the nature of incoming wastes.

Option B) OWMC would run three different facilities at separate locations. The first would have a treatment plant for organic waste and a screening laboratory; the second would have a treatment plant for inorganic waste, including solidification of residues, and a comprehensive laboratory; the third would dispose of treated residues from both the others.

Option C) The organic and inorganic treatment plants, with a comprehensive laboratory, would be at one site, and the disposal facility elsewhere.

Option D) OWMC would operate a series of "mini" treatment plants for inorganic wastes, each with its own screening laboratory. There would also be one central facility, comprising a treatment plant for organic wastes, a disposal facility for treated residues, a comprehensive laboratory, and a small unit for treating the inorganic runoff from contaminated areas.

Evaluation

Like OWMC's proposal, these alternatives would provide the capacity needed to treat a substantial portion of Ontario's special waste and ensure compliance with all provincial regulations. However, two sites obviously would require more extensive environmental site selection studies and engineering work than a single site. There would have to be an independent site selection process for each site, comparable to the comprehensive process that led to OWMC's currently preferred site. This process would require a correspondingly longer time and higher cost to provide the needed capacity.

Option A with its twinned comprehensive facilities would require a much greater public investment because of the greater land requirement, loss of economies of scale, and duplication of services. For similar reasons the other alternatives would require at least as much investment as A. These extra costs would have to be paid by the public or by the generators.

In option D, the miniplant alternative, the higher operating costs of multiple facilities could be offset in part by reduced transportation costs and the smaller economies of scale associated with treating inorganic wastes. The final treatment cost would depend on distances travelled and volumes hauled. However, no miniplant could have the full array of treatment processes and some wastes from a given location would have to go to miniplants with suitable facilities in another area. Also some wastes require treatment by several processes and there would have to be considerable movement of partially treated wastes between miniplants.

If more communities became sites for elements of OWMC's waste treatment system, the potential impacts would become greater than under OWMC's proposal. At the same time, more facilities could result in more jobs in the local communities, but at a higher operating cost. Although the communities with the treatment facilities would still be subject to the potential risks of transporting the untreated wastes to the facilities, volumes would be lower.

The risks to any individual community's health and safety would be somewhat less than those under OWMC's proposal, since the same types of facilities would be involved and the quantities to each would be less. Option A, with two comprehensive facilities, might pose a slightly higher total risk of an accident, when compared with OWMC's single facility. Transportation risks would vary. They would be greatest under option B, with dispersed specialized facilities, because more transport would be needed between facilities. Options B and C would require a large volume of truck traffic to the disposal site, but the associated risks are offset in that most of the trucks would contain detoxified residues from treating inorganic waste. The

risks to workers would be much the same as in OWMC's proposal, since the same operations would be taking place.

There is no assurance that OWMC could find several sites all offering the environmental advantages of the West Lincoln site. This site was selected after a review of approximately 150 other potential site areas. In addition, a unified management system at a single site is a more easily controlled system, thus, simplifying monitoring and adherence to high safety standards.

Finally, no region contains only organic or only inorganic waste, and therefore, no region could be served by a local miniplant with less than the full array of treatment processes provided. Some waste would still have to go to a full service centralized plant or to a remote miniplant with the required treatment processes.

A centralized treatment facility such as proposed by OWMC will minimize these difficulties and provide many distinct advantages over a decentralized system, although OWMC's proposal does not preclude future local collection or transfer stations with some local pretreatment, such as dewatering. And of course larger generators may be pretreating their own waste and sending the residues to OWMC's centralized facility.

D. FINDINGS AND CONCLUSIONS

A qualitative evaluation of such conceptual alternatives has been carried out. OWMC's proposal and the no action alternative were taken as the bases for comparison. Table 4.2 shows the final ranking of the alternatives including OWMC's proposal.

The evaluation of alternatives produced several notable findings.

- Treatment and disposal facilities are needed to deal with the problem of special waste. Treatment alone, whether at fixed or mobile

facilities, is not enough; residues from these processes would still require secure disposal.

- A 4R program is a valuable adjunct to treatment facilities, since some wastes amenable to 4Rs can be treated on site, reducing transportation, treatment and disposal requirements. OWMC's proposal assumes a strong publicly supported 4R program aimed at improving treatment processes within plants with significant waste reduction.

- 4Rs, joint ventures and mobile technologies should all be considered on a case by case basis, but treatment and disposal facilities must be provided to permit the system to function effectively, and safely.

- Treatment and disposal facilities must be centralized for maximum effectiveness, safety and control. In other jurisdictions, such as Western Europe, centralized facilities have proven successful and have been established along with private sector initiatives.

- Such centralized OWMC's facilities are necessary to reduce the negative effects of improper waste management of the environment and human health. In no jurisdiction have private efforts succeeded entirely in providing adequate environmental protection services.

The evaluation concluded that OWMC's proposal is superior to all alternatives because it can deal successfully with the problem of special waste while minimizing risk and impacts. The proposal therefore is an important and vital component of a proper waste management system for Ontario, and one which should be undertaken at this time. Aspects of other alternatives for OWMC to consider in the future could include the active support of the private sector, and the use of mobile facilities for the treatment of specific wastes.

Table 4.2
Final Ranking of Alternatives
Source: A.D. Little (B7)

Rank	Alternatives
1	OWMC's proposal
2	Many Decentralized Physical/Chemical Treatment Units with Single Incineration and Landfill Facilities
3	Centralized OWMC Incinerator, Physical/Chemical Treatment and Solidification Facility with Private Landfill
4	Decentralized Separate Treatment and Disposal Facilities
4	Centralized OWMC Incinerator, Landfill and Solidification Facility with Private Physical/Chemical Treatment
4	Active Support of Private Sector by OWMC
5	Decentralized Comprehensive Facilities
6	Decentralized Specialized Facilities
7	Centralized OWMC Incinerator Facility with Private Physical/Chemical Treatment and Landfill
8	Mobile Facilities
9	Continued Active Four R Program as OWMC's Only Role
9	No Action

Chapter 5:
Management of Special Waste

Chapter 5:
Management of Special Waste

INTRODUCTION

For the reasons developed in the previous chapter, OWMC believes there is a need in Ontario for publicly-owned treatment and disposal facilities. By building its facilities, OWMC can provide a better way to treat and dispose of the special wastes currently threatening Ontario's environment. But what part of the problem should OWMC tackle? For what slate of wastes should OWMC design its plant?

These are essentially market questions. They really ask, "at what part of the future special waste market should OWMC direct its marketing effort"? This chapter describes some of the marketing assumptions, and decisions which have influenced the design process described in Chapter 6.

A. THE SPECIAL WASTE MARKET

1. The Waste Management Hierarchy

Chapter 3 described briefly a number of the on-site and off-site destinations from which special waste generators choose when dealing with their waste. There is, however, another, more generic way of describing the array of techniques available for the storing, treating or disposing of special wastes that is often referred to as "the waste management hierarchy".

This hierarchy is a list of the techniques ranging from the most environmentally acceptable method of dealing with waste to the measure of last resort:

1. abatement;
2. reduction;
3. recycling or re-use;
4. recovery;
5. destruction;
6. treatment;
7. disposal.

Since different special wastes have different characteristics and affect the environment in different ways, applying this hierarchy is a complex process. The options available for managing each individual waste stream must be evaluated separately, and each generator will select a level of the hierarchy, and/or a destination, which is influenced by the major market forces: regulation, economics and technology.

As indicated earlier, regulatory actions recognize that certain contaminants occurring in waste materials should be prevented from entering the environment uncontrolled. By issuing regulations, the government has demonstrated its concern for the proper management of such contaminants. Regulation defines the market by identifying those wastes that are of concern and by controlling treatment, transport, and disposal.

The government's approach to regulation currently is going through important changes that will alter decisions made on special waste management. When these are implemented, rapid changes are expected in the market: broadly speaking, more waste will be directed to better treatment and disposal, and hence the types and amounts of contaminants entering the environment will be reduced.

Both generators and private managers of special wastes respond to the economic situation created by the regulatory and technical factors. Private managers inevitably will seek to manage special

wastes as economically as the regulations of the day permit. This can influence the techniques on the level in the waste hierarchy selected for the individual waste, and the level can range from abatement to disposal.

While the results for a particular material at a specific plant may be hard to predict, the results overall can be predicted reasonably confidently. There is a clear trend to more stringent regulation, higher economic cost of treatment and disposal, and improved technology.

The improvement of technology is a key factor because if special wastes are to be managed safely and responsibly in Ontario, all the management options must be available. However, as was shown in the previous chapter, the most essential are the destruction, treatment, and disposal facilities which are rated highest, because no matter what emphasis is given to the other options there inevitably will be residues that can only be disposed of in these three ways.

2. The Waste Management Gap

These trends will produce in the next decade future waste management practices which will differ substantially from the practices of the past decade. This "gap" between past and future practices provides a basis for estimating the total potential market for all the participants in special waste management. Each time a waste stream is upgraded to meet future waste management standards, it fills a part of the gap.

The size of the total potential market is difficult to estimate. Such difficulties include: complications of anticipating which individual wastes will be declared to be "special"; establishing the further potential for waste abatement, reduction, reuse, recycling and recovery which may be provided by higher treatment and disposal costs; the quantities of residues that will result from increased 4R activity; and which wastes now managed on-site will be sent off-site in future - and vice versa. Despite these difficulties, and despite

the fact that any effort to measure the gap must have a very high degree of uncertainty, it is useful for planning purposes to make that effort.

Since the technology requirements for managing organic wastes differ significantly from those for managing inorganic wastes, OWMC has completed separate assessments.

a) The Organic Waste Gap

Based on Canviro's survey data, OWMC estimated that 63 percent of the organic special waste managed off-site was being landfilled or exported, and 58 percent of what was managed on-site was going to sewers, land disposal or storage. Only about 40 percent of the waste sampled was being treated, recycled or incinerated (Canviro, (B2)).

In applying these proportions to estimates of waste generation in Ontario, the results suggest an organic waste management gap which could be as large as 320 000 t/a although the uncertainty of the data means that this figure could be too high. Figure 5.1 shows how the present system for managing these wastes can be changed by applying better waste management technologies in a market with higher regulatory standards.

b) The Inorganic Waste Gap

Canviro's survey showed that 70 percent of the special inorganic waste managed commercially went to landfill or export, while 85 percent of what was managed on-site went to sewage, land disposal or storage (Canviro, (B3)).

Applying these proportions suggests an inorganic gap of 500,000 t/a, but the uncertainty of this estimate also remains high because of the nature of the data and the difficulty in defining future treatment standards for individual waste streams. The general potential for the improved management of inorganic special wastes is shown in Figure 5.2.

The gaps defined above refer to the total potential for improved management of organic and inorganic wastes. OWMC believes that increased application of the 4R's and on-site treatment will account for the filling of a certain proportion of the gaps.

OWMC also views the gaps as important opportunities for the private waste management industry. Expansion or improvement of existing facilities and/or the establishment of new facilities could account for a significant additional filling of the gaps identified above.

OWMC must therefore decide what its own facilities should contribute to the general trends closing the waste management gap. In market terms OWMC must define the portion of the gap at which it will direct marketing efforts. The concept of filling the waste management gap has been an important factor in the determination of the facility design, as discussed in Chapter 6.

B. OWMC'S ROLE - THE "PRIORITY WASTE" MANAGER

Based on the facilities development goals and the assessment of the special waste problem, OWMC has decided that its facilities should be capable of dealing with all types of special waste generated in the province. If Ontario is to invest in publicly owned facilities, it makes sense that these facilities should offer a broad service to ensure that every class of special waste can be handled within the province. If other jurisdictions remove or reduce access to out-of-province waste management facilities, or if Ontario's own regulators decide certain "fates" are no longer appropriate, OWMC's facilities can provide a safe alternative.

In developing the market approach, however, OWMC has to be more than a treater of last resort. The OWMC facilities can make a positive impact on the special waste problem if directed at the most appropriate part of the waste management gap.

Figure 5.1
Organic Special Waste - Filling the Gap
Source: OWMC, 1986

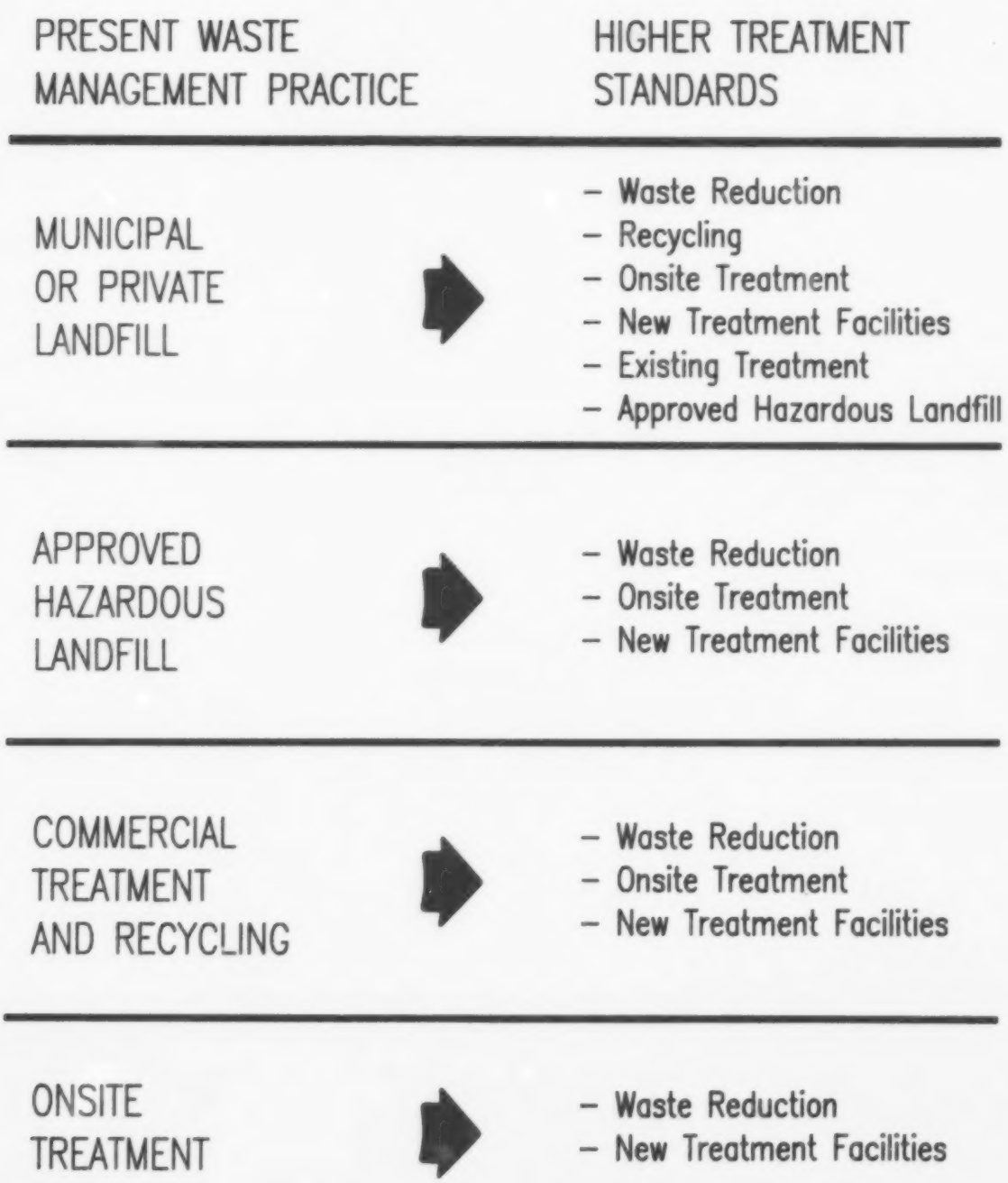
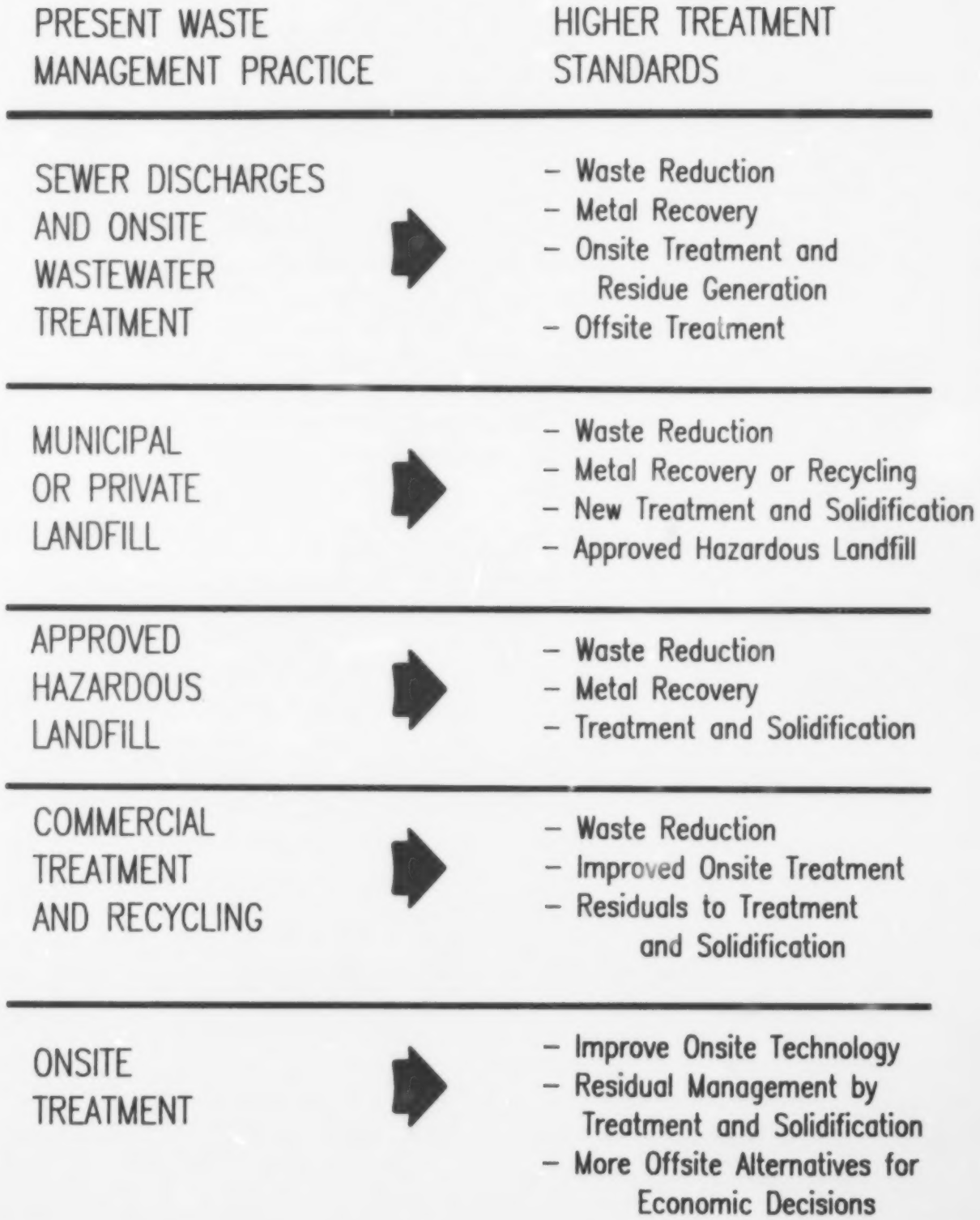


Figure 5.2
Inorganic Special Waste - Filling the Gap
Source: OWMC, 1986


PRESENT WASTE MANAGEMENT PRACTICE
HIGHER TREATMENT STANDARDS
SEWER DISCHARGES AND ONSITE WASTEWATER TREATMENT
– Waste Reduction
– Metal Recovery
– Onsite Treatment and Residue Generation
– Offsite Treatment
MUNICIPAL OR PRIVATE LANDFILL
– Waste Reduction
– Metal Recovery or Recycling
– New Treatment and Solidification
– Approved Hazardous Landfill
APPROVED HAZARDOUS LANDFILL
– Waste Reduction
– Metal Recovery
– Treatment and Solidification
COMMERCIAL TREATMENT AND RECYCLING
– Waste Reduction
– Improved Onsite Treatment
– Residuals to Treatment and Solidification
ONSITE TREATMENT
– Improve Onsite Technology
– Residual Management by Treatment and Solidification
– More Offsite Alternatives for Economic Decisions

In determining market priorities, OWMC was influenced by two important principles that are based on the analysis of waste management in Ontario.

First, OWMC's facilities were not planned to replace the existing waste management system with a publicly owned monopoly. The existing commercial waste management industry is well established and has shown itself capable of providing adequate treatment disposal for a significant part of the special waste generated. The resources for technological upgrading and expansion exist to further encourage this, although approval of new sites could be difficult and uncertain.

Secondly, OWMC does not intend to be a competitor of the private sector waste management operators. This could simply lead to economic pressures on management standards which would weaken the most responsible and conscientious private sector managers. It should not be the primary role of a public agency to make profits on waste management.

OWMC will therefore concentrate on priority waste management. Its three goals emphasize the reduction of risks and impacts arising from the management of special wastes. By focusing on risk reduction, and therefore on where the most damage is caused, OWMC's facility will achieve the best results for the public investment dollar.

If OWMC's facilities are to play an optimal role in improving the management of special wastes, then its marketing and business development must be oriented toward shifting waste management up the hierarchy and/or to better management standards. The Waste Reduction Program and the increasing regulatory, economic and technological, pressures tend to direct waste towards better management and treatment. OWMC's facilities will provide the best practical treatment for wastes unsuited to management higher in the hierarchy and for residues from other treatment processes, recycling, or reduction. OWMC refers to the wastes needing its treatment capacity as "priority wastes".

Two factors have been developed to assess the potential environmental concern for waste and to assess the ability to manage the

wastes to a higher standard. These factors have been used to measure the environmental and human health concern index. It includes both short and long term effects and covers toxicity, carcinogenicity and explosiveness. This index provides a ranking of special waste categories on a scale from most concern to least concern. The ranking is a gross assessment of the potential for the wastes to cause immediate or long-term harm to human health and the environment.

A second index, the treatability index ranks the same special waste categories on a scale from those most easy to treat to those most difficult to treat. The ranking gives a gross assessment of how well either on-site or off-site treatment can deal with these wastes, with some allowance for the potential to treat them by improved methods in the future.

The environmental and human health concern index helps to focus OWMC's attention on those wastes most likely to harm human health and the environment. The higher the hazard ranking, the more urgent the need to treat or destroy the wastes in question. Some examples of wastes with a high ranking on this index are degreasing sludge, halogenated solvents with heavy metals and other halogenated solvents.

The treatability index expresses the availability of treatment technologies or the economic burden of treating waste. This index directs OWMC to the wastes that are least likely to be receiving optimal treatment. Some examples of wastes with a high ranking on this index are halogenated still bottoms, still bottoms and ink sludge.

Establishing priorities for OWMC's marketing effort will maximize the environmental benefit to the province, while minimizing undesirable effects on the existing waste management industry.

Conclusion

OWMC views itself as a partner in the provincial effort to reduce environmental effects caused by special waste. It cannot, by itself, solve the whole of the problem described in Chapter 3. It can continue to encourage the use of the 4Rs on-site and off-site, but it assumes

equally important roles for the other participants; the commercial treaters, recyclers and the generators who produce the waste.

The most important contribution OWMC can make to the reduction of the effects caused by special waste is to provide modern facilities for the treatment and disposal of these materials. The use of these facilities can be optimized by the concept of OWMC as priority waste manager.

Chapter 6:
Alternative Methods - Treatment and Disposal Technologies

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Alternative Methods - Treatment and Disposal Technologies

The purpose of this chapter is to describe the decision making processes which led OWMC to the selection of preferred treatment and disposal technologies, and the development of the facility's conceptual design and operation. The components of the facility were chosen through a technology evaluation process. These technologies were then integrated in a conceptual design to ensure that the proposed facility will pose the minimum risk to human health and the environment, by securing the greatest effectiveness and efficiency in the treatment and disposal of special wastes.

A. FACILITY DESIGN AND DEVELOPMENT PROCESS

OWMC evaluated alternative treatment and disposal technologies at two levels.

First, the broad range of available generic technologies was assessed, assembled into alternative systems and evaluated.

Secondly, component technologies of the preferred system were evaluated. A conceptual design was then developed for the facilities.

The evaluation criteria used for technology selection were derived from OWMC's three facility development goals, design and operation principles and policies that evolved during the process. These principles and policies were:

1. The facility must have the flexibility to treat all types of special waste generated in Ontario, except radioactive waste.

2. Only proven technologies defined as "commercially demonstrated to perform reliably for a period of at least 12 months, on a scale and in a manner comparable with that required by the OWMC facility" can be used in this facility design.

3. No untreated wastes will be deposited in the engineered landfill or released to a receiving water body.

4. All waste must be treated to the maximum extent possible using the best available proven technology, prior to its final disposal.

5. The site chosen for OWMC's facility must afford natural protection, as well as that provided by the engineering design.

At both levels of the technology evaluation, the following procedure was followed, consistent with the EA Act requirements:

1. The potentially affected environment was identified and described.

2. Alternatives were identified and assessed for their potential environmental effects, singly or in combination. Technical, operational and economic features were also assessed. This involved the development of criteria for evaluation of alternatives.

3. Ways to improve or modify the alternatives were considered whenever appropriate.

4. The preferred alternative(s) were selected on the basis of the evaluation results, taking into account the advantages and disadvantages of all the potential alternatives.

To carry out this process, OWMC used the services of consultants. Proctor & Redfern Ltd. identified and assessed all of the available generic technologies relevant to the treatment and disposal of special waste. Arthur D. Little International Inc. updated this work and carried

out the first stage of analysis involving generic technologies and systems options evaluation. Monenco Limited undertook the second stage of analysis involving the evaluation of component technologies. Monenco also developed the conceptual design.

Ten technical reports pertinent to this evaluation process are filed in support of this environmental assessment. These reports are:

- "Generic Process Technologies Study", Proctor & Redfern Ltd.; 1982 (C2)
- "Systems and Technologies for Treatment and Disposal of Special Waste in Ontario", Arthur D. Little International Inc.; 1986 (C3)
- "Evaluation of Alternative Disposal Options", Gartner Lee Associates Ltd.; 1986 (C4)
- "Disposal Option Evaluation - Summary Report", OWMC; 1986 (C5)
- "OWMC Treatment Facility Process Area Report - Incineration", Monenco Limited; 1986 (C6)
- "OWMC Treatment Facility Process Area Report - Physical/Chemical Treatment", Monenco Limited; 1986 (C7)
- "OWMC Treatment Facility Process Area Report - Solidification", Monenco Limited; 1986 (C8)
- "OWMC Treatment Facility Process Area Report - Engineered Landfill", M.M. Dillon for Monenco Limited; 1986 (C9)
- "OWMC Treatment Facility Process Area Report - General Facilities", Monenco Limited; 1986 (C10)
- "OWMC Treatment Facility Facility Description", Monenco Limited; 1986 (C1)

B. GENERIC TECHNOLOGIES AND SYSTEM OPTIONS EVALUATION

The process undertaken for this stage of the evaluation included the identification and assessment of all generic treatment and disposal processes for special waste available worldwide. OWMC's consultants, Proctor & Redfern, described each identified process in terms of its general process application, reliability, effluent and residuals remaining for further treatment or disposal, economic factors, energy requirements, potential for resource recovery and the possible environmental effects of each generic technology (P&R, C2).

After reviewing the Proctor & Redfern report, OWMC concluded that the following technologies should form part of its treatment and disposal system:

1. Incineration plant - rotary kiln and associated flue gas treatment system.

   The rotary kiln incinerator was chosen because of:

   1) its capability to treat all the categories of organic special wastes generated in Ontario;

   2) its flexibility in treating solids, sludges or liquids, separately or simultaneously;

   3) its ability to destroy various types and sizes of contaminated containers; and

   4) the very low levels of contaminant emissions that can be achieved consistently when a flue gas treatment system is added.

2. Physical/chemical treatment and solidification plants - oxidation/reduction, neutralization, precipitation, sedimentation, oil/water separation, centrifugation, solidification/stabilization.

These technologies were chosen for their flexibility and effectiveness in treating waste. OWMC recognized, however that other technologies - such as ion exchange, carbon adsorption, resin adsorption, and ozonation, might have to be included for treating specialty wastes, and that still other technologies might have to be added when the characteristics and amounts of the waste streams arriving at the facility become better known.

3. Engineered landfill

This disposal option was chosen because:

1) It provides a safe and economical repository for the solidified treated residues from the incineration and physical/chemical processes.

2) The technology is proven. With the proper hydrogeologic setting, design and operation, an engineered landfill will provide an acceptable level of controlled release of residual contaminants to the environment.

OWMC had to decide on the preferred incineration technology and disposal option at this early stage in the evaluation process to establish any facility characteristics that might have a direct effect upon human health or the environment. Such characteristics had to be noted for the site selection process activities. In deciding where to locate its facilities, OWMC had to consider the potential impacts of the facility on the environment and minimize them where possible. As a result of the generic technology evaluation, two requirements were imposed on the site selection process:

1) atmospheric conditions that would adequately disperse residual contaminant released into the air; and

2) a hydrogeologic environment that would provide a secure level of containment for contaminants should they be accidentally released.

At a later stage, A.D. Little was commissioned to update the data base and evaluate generic technologies (ADL, C3). A two part evaluation was undertaken by A.D. Little. First, the technologies were assessed against the criterion of proven technology. Only proven technologies were further evaluated in the second step. The broad list of available proven and unproven generic treatment/disposal technologies is given in Table 6.1.

The proven technologies were then evaluated using criteria described in Figure 6.1. Among the 43 proven technologies, anywhere from one to 16 processes were found to apply to any given waste type (UCD category).

These technologies were then assembled and grouped by A.D. Little into various treatment systems options. To reduce the number of options, four guidelines were used:

1. For the first system option (System 1), each waste type was to be assigned to the highest ranking technology capable of treating it;

2. In developing other system options, the features of System 1, were considered and various means of optimizing them adopted;

3. For all system options, all solid residues must be sent first to the solidification plant and only then to the engineered landfill for disposal;

4. For all system options, liquid effluent from a given technology must go to another technology already in the system or be discharged without further treatment.

As a result, five system options were developed as follows:

1. System 1 (Highest Ranking Component Technologies): This system was derived by combining those technologies that received the highest score in the technology ranking, into a system capable of treating all the waste types expected to be received by OWMC. No regard was given to the efficiency of the system that resulted.

Table 6.1
Available Generic Treatment / Disposal Technologies

Source: A.D. Little (C3)

Proven Technologies	Unproven Technologies
o Biological Treatment Processes	
Activated Sludge	Composting
Activated Sludge/Powdered Activated Carbon Treatment	Enzyme Treatment/ Mutant or Adapted Microorganisms
Activated Sludge Using Pure Oxygen	Sequencing Batch Reactor
Anaerobic Digestion	
Fluidized Bed Contactor	
Land Treatment	
Rotating Biological Contactor	
Trickling Filter	
Waste Stabilization Pond	
o Physical Separation Processes	
Air Stripping	Electrophoresis
Carbon Adsorption	Freeze Drying
Centrifugation	Liquid Ion Exchange
Dissolved Air Flotation	Magnetic Separation
Electrodialysis	Supercritical Fluid Extraction
Emulsion Breaking	Suspension Freezing
Evaporation	Zone Refining
Filtration	
Flocculation/Sedimentation	
Resin Adsorption	
Reverse Osmosis	
Solvent Extraction	
Steam Stripping	
Ultrafiltration	
o Chemical Treatment Processes	
Chemical Reduction	Chlorinolysis
Chemical Oxidation	Cavitation Hydrolysis
Dehalogenation	Supercritical Water Oxidation
Ion Exchange	UV/Ozonation
Neutralization	UV/Hydrogen Peroxide
Precipitation	Vertical Tube Wet Air Oxidation
Wet Air Oxidation	

Table 6.1 (continued)
Available Generic Treatment / Disposal Technologies

Source: A.D. Little (C3)

Proven Technologies	Unproven Technologies
o Thermal Treatment Processes	
Cement Kiln Incineration	Calcination
Fluidized Bed Incineration	Catalysis
Liquid Injection Incineration	Fluid Wall Reactor
Multiple Hearth Incineration	Inferared Electric Furnace
Pyrolysis	Molten Salt Incineration
Rotary Kiln Incineration	Molten Glass Incineration
	Plasma Arc
	Microwave Plasma Discharge
o Solidification/Stabilization Processes	
Cement Based Processes	Organic Polymer Stabilization
Lime Based Processes	Thermoplastic Stabilization
Silicate Based Processes	
o Disposal Processes	
Deep Well Injection	RUMOD (underground rock storage)
Geologic Isolation	
Engineered Landfill	
Warehouse Storage	

2. System 2 (Highest Ranking Component Technologies - Improved): This system modified System 1 by eliminating some primary treatment technologies, such as centrifugation and flocculation/sedimentation of organic wastes and dewatering of inorganic wastes, to reduce the complexity of the system and to reduce the quantity of liquid effluent generated.

3. System 3a (Zero Surface Water Discharge - Solidification): All liquid effluents and solid residues were to be solidified prior to disposal. This system eliminated some technologies, such as precipitation of inorganic wastes, which were considered unnecessary under a total solidification scenario.

4. System 3b (Zero Surface Water Discharge - Evaporation): All liquid effluents were to be evaporated. This system added evaporation blowdown to the waste streams to be solidified. Unsuitable primary treatment technologies, such as powdered activated carbon treatment of organic wastes, was eliminated from the system.

5. System 4 (conventional European Practice): This system was based on existing hazardous waste treatment facilities in Europe, i.e. incineration of organic wastes, physical/chemical treatment of inorganic wastes, and disposal of treatment residues. It generally reflected the system preferred by OWMC.

These five system options were evaluated in two ways: by component technologies and by system feature. The evaluation by component technologies examined the system options using the results of the technology ranking. The evaluation by system features compared the system options based on the overall characteristics of the system as a whole.

The technology ranking evaluated the technologies according to the criteria that were specifically developed to measure how well OWMC's three goals were achieved. The relationship of evaluation criteria to OWMC's three goals is illustrated in Figure 6.1.

The system features addressed how well the system options met OWMC's goals. These features, in order of importance, were:

- o volume of gaseous emissions;
- o amount of liquid effluent treated and discharged to surface water;
- o amount of residuals to land disposal;
- o amount of waste handled by the secondary system;
- o number of technologies in the system;
- o operating cost.

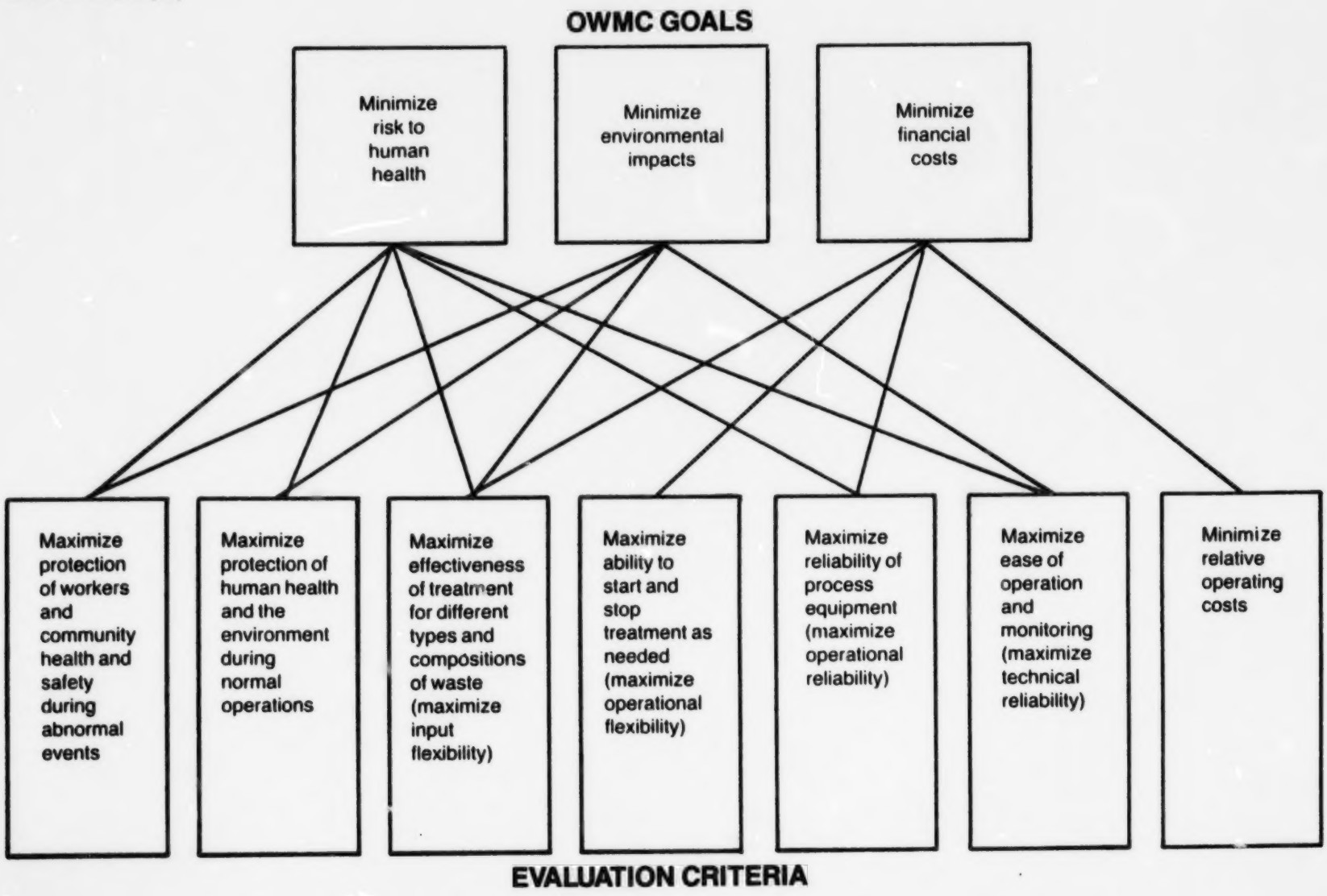
Following these evaluations, A.D. Little concluded that, within the context of the conceptual study, System 2 is slightly better than System 4, and is best among all system options in meeting the criteria established for the evaluation, which were based on OWMC's goals. System 2 would have a marginally lower amount of air emissions than System 4 because of the use of activated sludge/powdered activated carbon, in lieu of rotary kiln incineration, to treat two organic waste types (UCD categories). System 2 would also have a lower amount of liquid effluent than System 4 because of the use of direct solidification, without dewatering, to treat ten inorganic waste types. However, the major disadvantages associated with System 2 would be the higher amount of solid residuals for land disposal and higher operating cost as a result.

A.D. Little further recommended that OWMC consider adding activated sludge/powdered activated carbon for treatment of aqueous organic solutions, and direct solidification, without dewatering, for treatment of inorganic solids and sludges.

The above recommendations have been accommodated in the present design of OWMC's facility.

The layout of the physical/chemical treatment plant provides space for possible addition of a biological treatment unit. The decision to incorporate a biological treatment unit, with or without powdered activated carbon, will be made after facility start-up when more is known about the wastes that are actually received.

Figure 6.1
Relationship of Evaluation Criteria to OWMC Goals
Source: A.D. Little (C3)


OWMC GOALS
Minimize risk to human health
Minimize environmental impacts
Minimize financial costs
Maximize protection of workers and community health and safety during abnormal events
Maximize protection of human health and the environment during normal operations
Maximize effectiveness of treatment for different types and compositions of waste (maximize input flexibility)
Maximize ability to start and stop treatment as needed (maximize operational flexibility)
Maximize reliability of process equipment (maximize operational reliability)
Maximize ease of operation and monitoring (maximize technical reliability)
Minimize relative operating costs
EVALUATION CRITERIA

The present design of the solidification plant also provides for total solidification of all the delivered wastes, with or without pre-treatment, or dewatering.

In parallel with the A.D. Little study, Gartner Lee Associates Ltd. and Monenco Limited also evaluated disposal technologies. Alternative disposal technologies were identified and described, and criteria established for the critical evaluations of the alternatives. Two criteria: proven technology and a natural level of protection, were applied to each alternative disposal technology as initial screens. If a technology failed to meet either of these criteria, it was not evaluated further.

Remaining alternatives were then evaluated by criteria developed to reflect OWMC's three facilities development goals. These, and their application to the disposal technologies are further detailed in OWMC's Disposal Options Evaluation Summary Report.

This evaluation led OWMC to confirm an engineered landfill as the best disposal option for the solidified treated residues.

The EA Act requirements for this evaluation were met in the following way.

1. **Description of Existing Environment Affected by Alternatives**

The provincial problems caused by special wastes are described in Chapter 3 of this Environmental Assessment. Evidence suggests that improper management of special wastes can lead to adverse effect on human health and impacts on the environmental. This is the existing environment within which the consideration of alternative methods of treatment and disposal were considered.

Early in the facilities development process, at a level of detail appropriate to that stage of technology evaluation, OWMC's consultants reached some general conclusions about siting considerations for such a facility. Such considerations include: engineering infrastructure; atmospheric conditions; surface water

inventory; environmentally sensitive areas; archaeology; transportation; and land use (OWMC (D1) pp.29-31).

2. Prediction of Effects of the Alternatives

Emissions, effluents and residuals associated with each of the generic technologies were discussed on a qualitative basis in the Proctor & Redfern report. General comments on the environmental implications of each alternative technology were also given in this report.

A.D. Little's report (C3) evaluated all of the proven generic technologies on a quantitative basis, by using a set of predetermined criteria. As illustrated in Figure 6.1, several of these criteria addressed the environmental effects of the available alternative technologies. All of these alternative technologies were ranked in accordance with the evaluation criteria.

The evaluation of all of the system options in the A.D. Little study (C3), by component technologies and by system features, addressed the environmental effects of each of the system options as a whole. In general, system options using the higher scoring component technologies which minimized gaseous emissions, liquid effluents and residuals sent to the landfill for disposal, would have the least environmental effect.

The results of the system options evaluation reflected the above. [ADL (C3)].

3. Mitigation or Changes and Improvements of the Alternatives

Mitigation as such was not considered for the evaluation or assessment of generic technologies. Mitigation is appropriate and possible only when there is some knowledge of the characteristics of the system as a whole.

Efforts to mitigate, change or improve the performance of all the alternatives, however, were undertaken by A.D. Little in the development and assessment of systems options. Such efforts were reflected in developing the system options, by consideration of the system features described earlier. Feature improvements, including: reduction of the volume of gaseous emissions; reduction in amounts of liquid effluents and residuals to the landfill for disposal; amount of waste handled by the secondary system; and reducing the number of technologies in the system, were incorporated in the development of all system alternatives other than System 1 - Highest Ranking Component Technologies.

4. Net Effects of the Evaluation

A.D. Little's technologies and system options evaluation study (C3) confirmed OWMC's general system option, with the addition of a biological treatment unit and direct solidification of inorganic solids and residues. This system meets OWMC's goals and objectives and consists of the following components:

- a rotary kiln incineration plant, for destruction of organic waste;
- a physical/chemical treatment plant, for detoxification, stabilization and reduction of inorganic waste;
- a solidification plant, for further stabilization of treated residues from the incineration and physical/chemical treatment plants;
- an engineered landfill, for final disposal of solidified, treated residues.

An assessment of net effects was not undertaken for this level of the technology evaluation since it was not possible without a receiving site. However, a further level of analysis at finer detail was undertaken. This is developed and described in the subsequent stage of technology evaluation.

C. COMPONENT TECHNOLOGIES EVALUATION AND CONCEPTUAL DESIGN AND OPERATIONS

This stage of the evaluation involved the selection of component technologies to make up each of the four process areas; incineration, physical/chemical treatment, solidification and engineered landfill. For each of these process areas, Monenco developed a set of guiding principles or assumptions reflecting OWMC's facilities development goals, design and operating principles and policies. Criteria used to evaluate and select component technologies are listed in Table 6.2. The conceptual design for each process area resulting from the component technology evaluation is discussed in detail in the relevant process area reports. The relationship of these reports is described in Figure 6.2. The evaluation of this stage is summarized below.

1. Four Main Process Areas

a) Incineration

The incineration plant comprises:

- a combustion system (rotary kiln and secondary combustion chamber);
- a flue gas cooling system;
- a flue gas treatment system.

Having selected a rotary kiln combustion system at an earlier stage, the component technology evaluation for the incineration process area evaluated alternative flue gas cooling and treatment systems. The first step was to identify potential technologies for flue gas cooling and treatment. The long list of technologies considered and the description of each can be found in Monenco (C6), pp.31-43. The short-listed five proven flue gas cooling technologies and six proven flue gas treatment

Figure 6.2
Flow Diagram of Supporting Documents
Source: M.M. Dillon, 1986

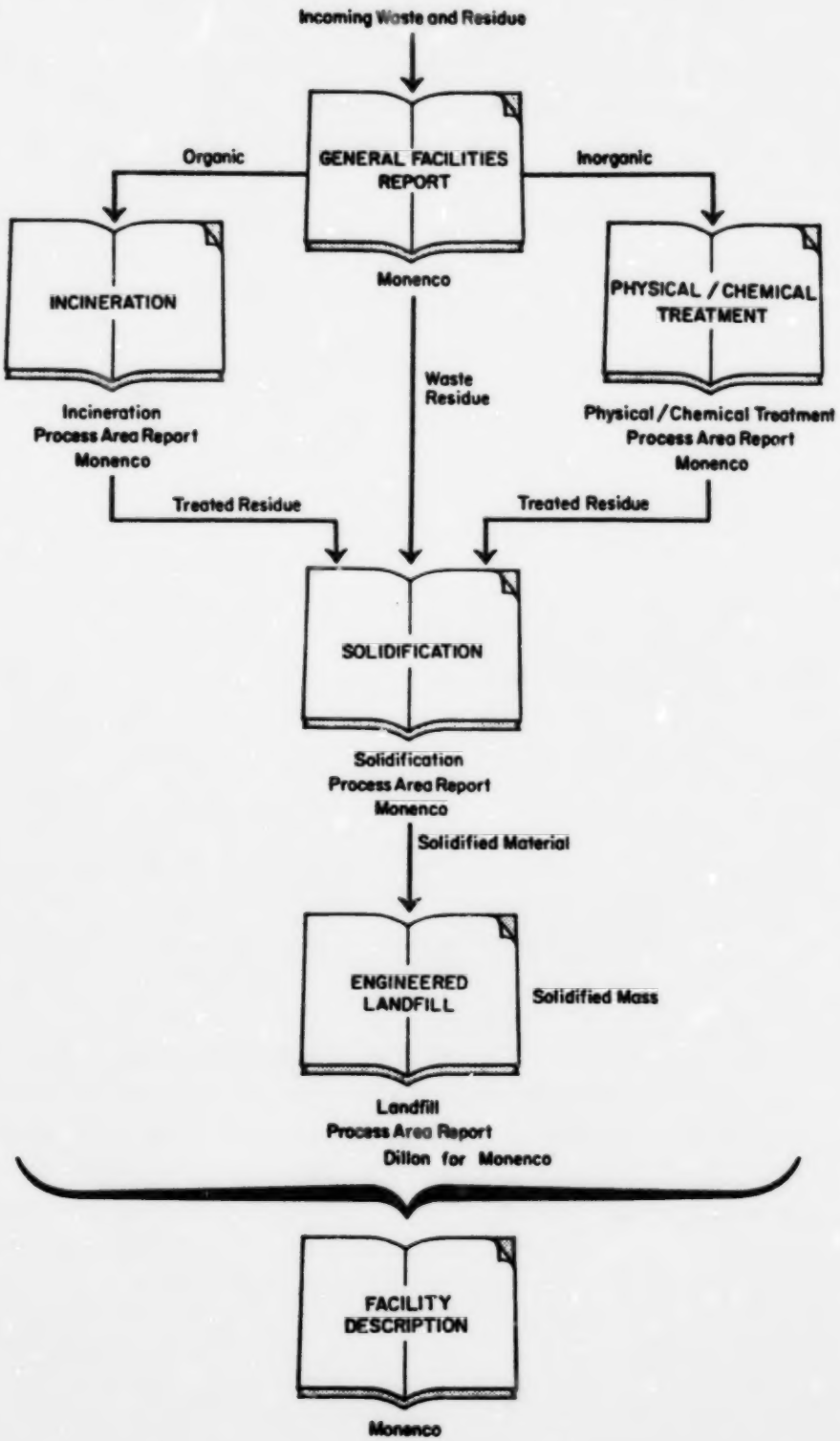


Table 6.2
Criteria Used to Evaluate Component Technologies
Source: Monenco (C6, C7, C8)

CRITERIA/SUB-CRITERIA	WEIGHTING FACTOR
Proven Technology	**Screening Criterion**
Performance	20 Total
- most effective treatment	10
- high efficiency: energy, utilities, reagents	2
- residue characteristics: quantity, quality	2
- extent of use elsewhere	6
Safety	20 Total
- low occupational risk	10
- low environmental risk	10
Flexibility	20 Total
- ability to accommodate a variety of wastes	7
- ability to accommodate varying amounts of waste	7
- ability to start up and shut down quickly	6
Reliability	15 Total
- low maintenance requirements	1
- least number of spare parts	2
- availability of spare parts and reagents	3
- low susceptibility to mechanical breakdown	1
- low vulnerability to process breakdown	8
Operations	10 Total
- low complexity	6
- high degree of automation	3
- low amount of expert assistance required for start-up	1
Commercial and Economic Considerations	10 Total
- restrictions on use	1
- low cost	7
- adequate supplier competition and reliability	1
- speed and ease of delivery	1
Benefits to Canada	5 Total
- high availability of Canadian engineering	1
- high availability of Canadian suppliers	2
- high potential for technology transfer	2

technologies were combined into system alternatives capable of fulfilling the defined process requirements, primarily objectives for removing particulates, acid gases and metals prior to discharge of the cleaned gas to atmosphere.

The combination of these technologies resulted in eight system alternatives. Out of these, the following system alternative was selected for flue gas cooling and treatment:

- o a radiant waste heat recovery boiler;
- o a spray dryer/reactor;
- o an electrostatic precipitator;
- o a three stage wet scrubber.

This system alternative is illustrated in Figure 6.3 and described in Monenco (C6), pp.63-67.

The advantage of this alternative over all others was its ability to combine the performance capabilities of wet scrubbers into an effluent free process, while still recovering useful energy from the system in the form of steam.

b) Physical/Chemical Treatment

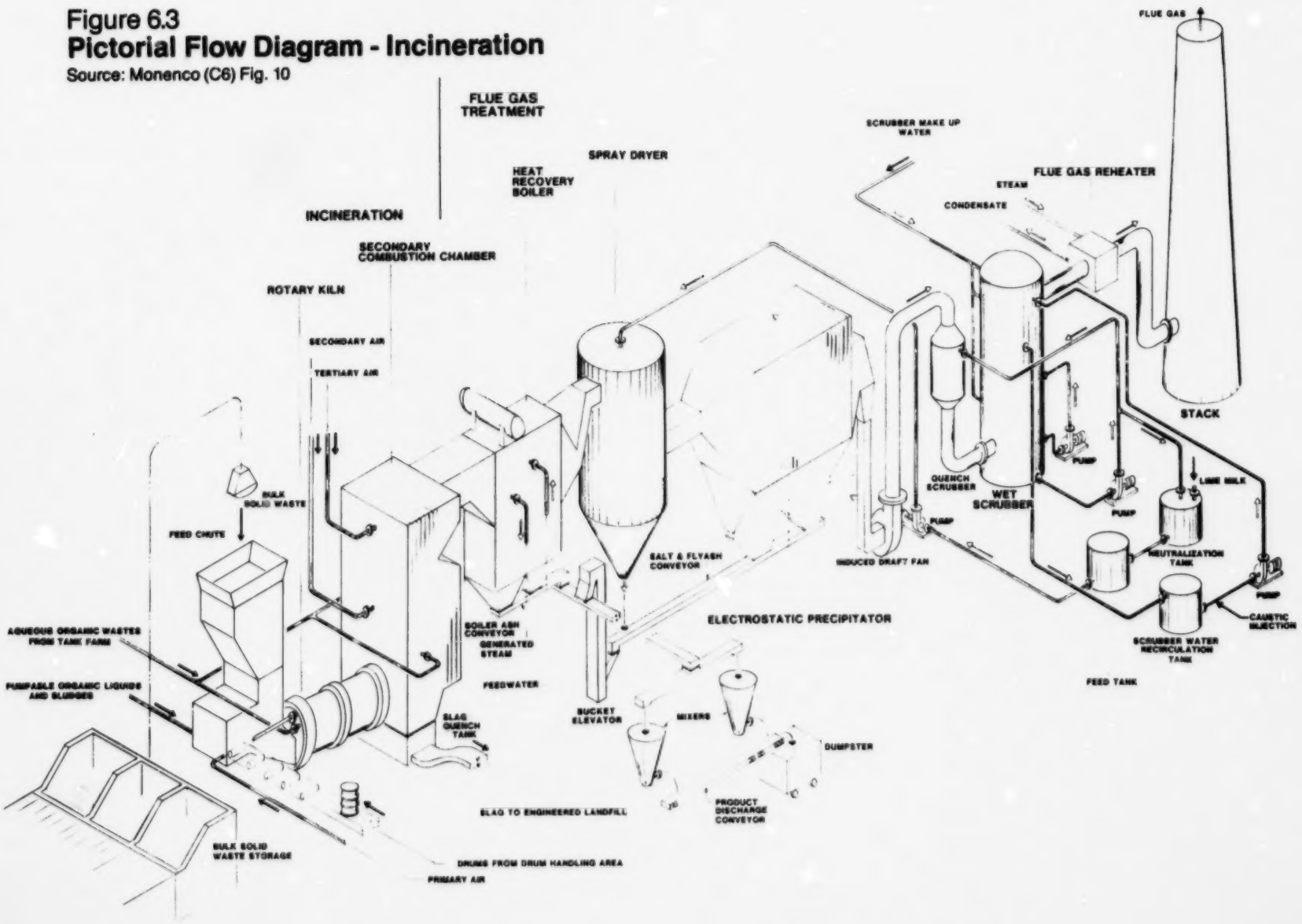
The physical/chemical treatment plant comprises:

- o an inorganic waste treatment system, to detoxify, stabilize and reduce the inorganic wastes delivered to the facility;

- o an aqueous organic waste treatment system, to remove or recover the organics from the aqueous organic wastes, so that they can be destroyed by incineration.

- o a miscellaneous waste treatment system, to detoxify, stabilize and reduce the wastes generated on-site.

Figure 6.3
Pictorial Flow Diagram - Incineration
Source: Monenco (C6) Fig. 10



Each of these treatment systems consists of three stages of treatment, namely: primary treatment, secondary treatment and effluent polishing. Each stage has a functional purpose that contributes to the accomplishment of overall treatment objectives established for the physical/chemical treatment process area.

Primary treatment is the first stage of physical/chemical treatment. It prepares the wastes for additional levels of treatment.

Secondary treatment aims at chemically stabilizing the wastes and reducing the concentration of both dissolved and suspended contaminants in the partially treated effluents, to the maximum extent possible. This results in two treated waste streams: an inorganic residues stream to be solidified and a liquid effluent stream to be further treated by the polishing steps.

Effluent polishing is the final stage of physical/chemical treatment, designed to remove residual concentrations of suspended solids, dissolved inorganics and dissolved organic contaminants from the treated effluent stream prior to its recycle and/or final discharge to the environment.

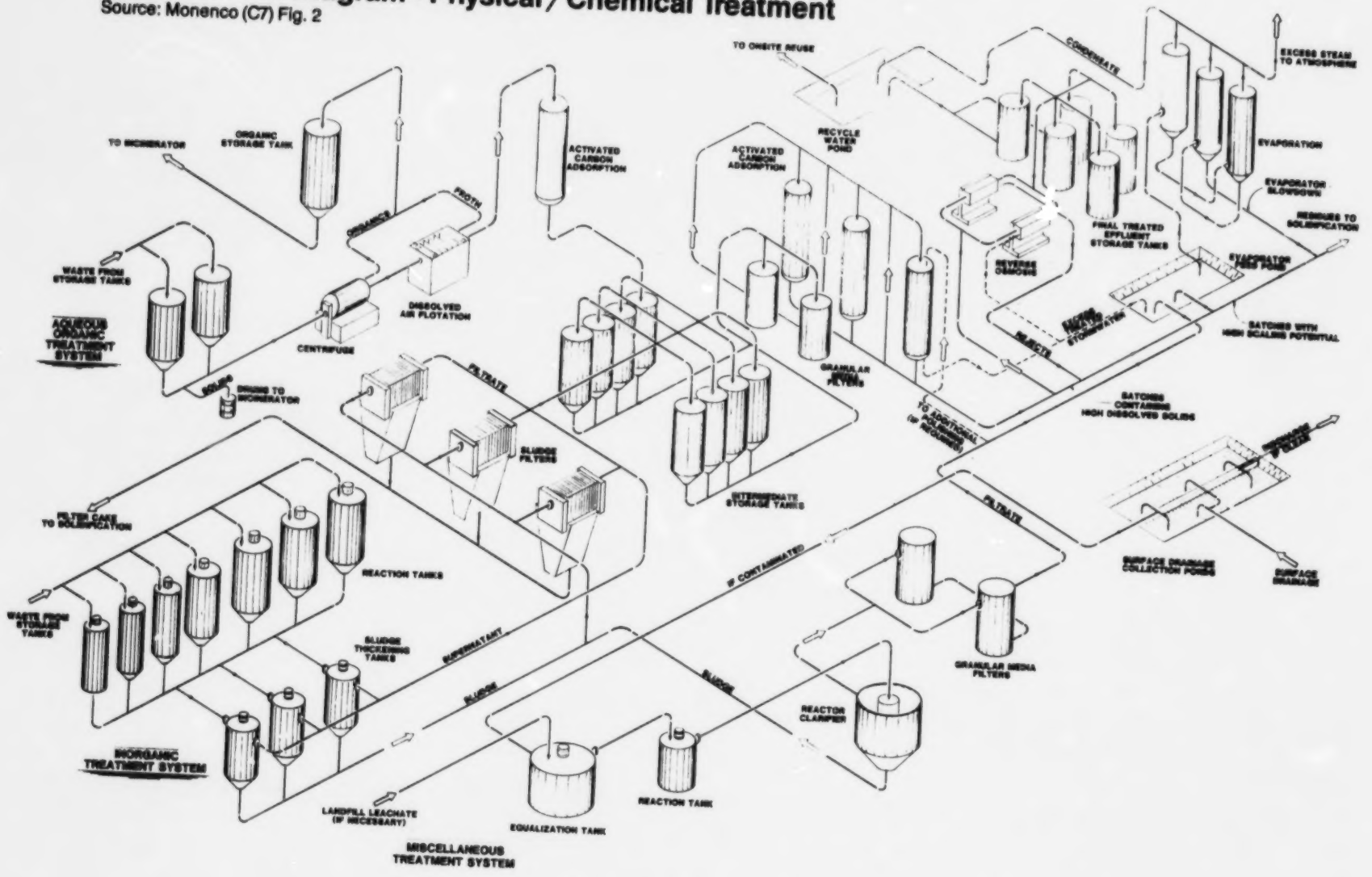
The technology evaluation started with identification of all potential technologies relevant to the treatment of special wastes by the physical/chemical methods. The long list of technologies considered and a description of each can be found on pages 34-44 and pages 59-122 of Monenco (C7). The 22 short-listed proven technologies were then evaluated in detail for their potential use in the primary treatment, secondary treatment and effluent polishing steps.

Following detailed evaluation using the criteria listed in Table 6.2, various combinations of technologies were selected for the three treatment systems. These preferred technologies are listed in Table 6.3, by treatment system and also by treatment stage.

Table 6.3
Preferred Physical / Chemical Treatment Technologies
Source: Monenco (C7)

INORGANIC WASTE TREATMENT SYSTEM	AQUEOUS ORGANIC WASTE TREATMENT SYSTEM	MISCELLANEOUS WASTE TREATMENT SYSTEM
o Primary Treatment: - phase separation; - dissolution/slurrying; - blending.	o Primary Treatment: - phase separation; - blending.	o Primary Treatment: - equalization.
o Secondary Treatment: - oxidation/reduction; - neutralization/precipitation; - coagulation/sedimentation; - sludge dewatering.	o Secondary Treatment: - emulsion breaking; - centrifugation; - dissolved air floatation; - activated carbon adsorption.	o Secondary Treatment: - neutralization/precipitation; - flocculation/sedimentation; - sludge dewatering.
o Intermediate Storage.	o Intermediate Storage.	o Intermediate Storage.
o Effluent Polishing: - granular media filtration; - activated carbon adsorption; - reverse osmosis.	o Effluent Polishing: - granular media filtration; - activated carbon adsorption; - reverse osmosis.	o Effluent Polishing: - granular media filtration; - activated carbon adsorption; - reverse osmosis.
o Evaporation.	o Evaporation.	o Evaporation.

Figure 6.4
Pictorial Flow Diagram - Physical / Chemical Treatment
Source: Monenco (C7) Fig. 2



The selected combinations of technologies for each of the three waste treatment systems are also illustrated in Figure 6.4 and described in Monenco (C7) pp.124-131.

These combinations of technologies were selected primarily because of their capability to best fulfill the respective process functions at designated stages of treatment, resulting in best achieving the ultimate system objective, of treating the wastes to the maximum extent possible.

c) Solidification

OWMC will solidify the treated residues from the incineration and physical/chemical treatment plants. Solidification inhibits the leaching of residual contaminants from the solidified mass deposited in the landfill, thereby further reducing the risk to human health and impact on the environment.

Alternative solidification technologies involve the use of different combinations of additives and/or reagents to combine with the waste residue and produce a solidified material that is physically and chemically stable. Solidification is, therefore, a form of physical/chemical treatment. Monenco considered it separately from other physical/chemical treatments because of the importance attached to this final step prior to the ultimate disposal of treated residues in the landfill.

The proposed solidification plant comprises:

- a high solids treatment system, to solidify the residues with high solids content (non-pumpable);

- a low solids treatment system, to solidify the residues with low solids content (pumpable).

As a first step in technology evaluation, the potential technologies for solidification of waste residues were identified.

The long list of technologies considered and the description of each can be found in Monenco (C8), pp.29-37 and pp.43-57. Using "proven technology" as a screening criterion, this list was reduced to the following eight potentially suitable technologies:

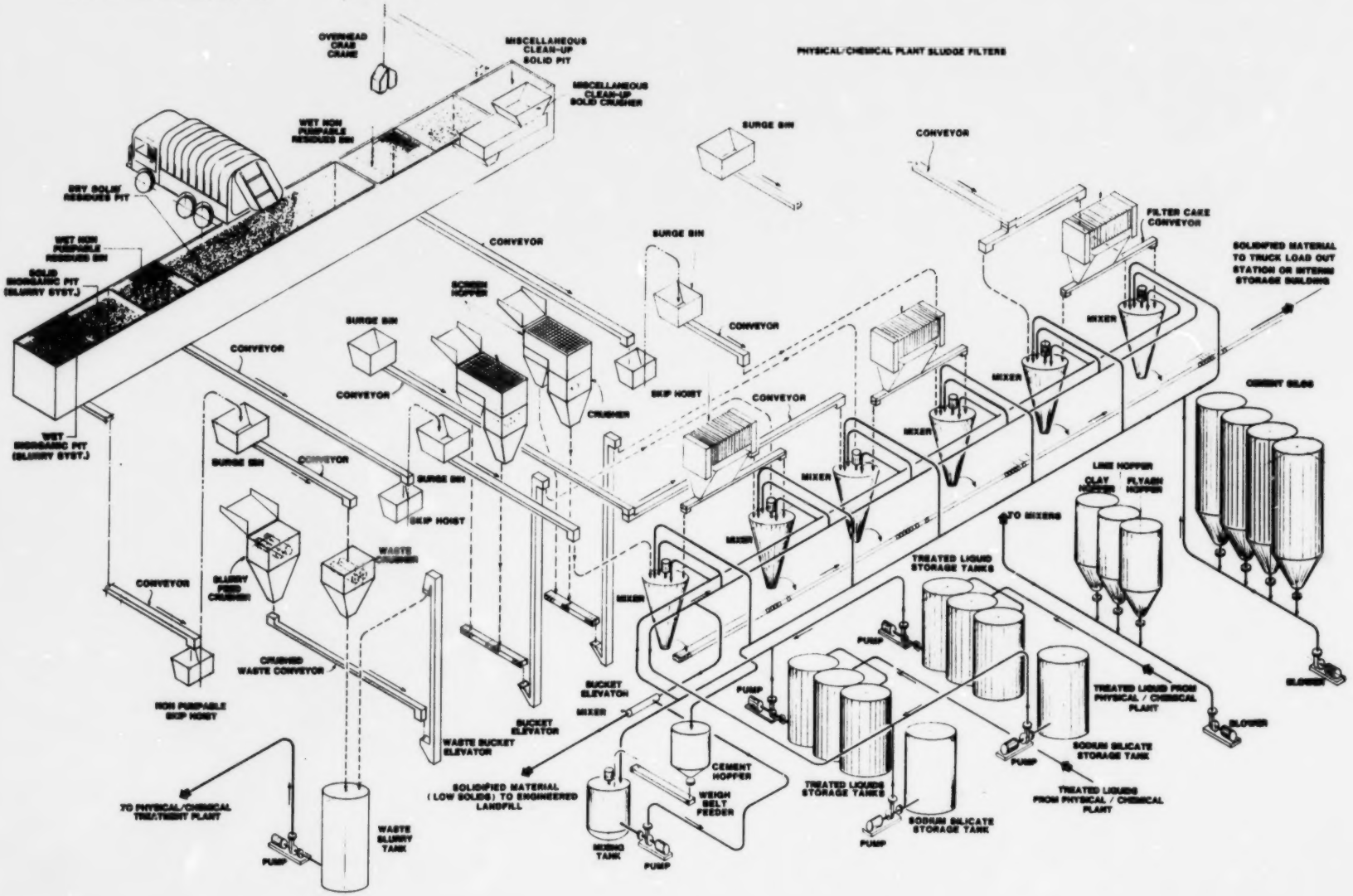
- Portland cement based;
- Portland cement/lime;
- Portland cement/clay;
- Portland cement/soluble silicate;
- Portland cement/flyash;
- lime/flyash;
- lime/clay;
- cement kiln dust or lime kiln dust.

Using the criteria listed in Table 6.2, these short listed technologies were evaluated in detail for their potential use in both the high solids and low solids treatment systems. The conclusion of the evaluation was that, the Portland cement based technology, with minor additives, was preferred for the high solids treatment system. While the Portland cement/soluble silicate technology was preferred for the low solids treatment system.

The selected technologies provided the most effective immobilization of residual contaminants of concern, for the broadest range of contaminants that may be present in the feed material to the solidification plant. This will provide a satisfactory containment of contaminants within the solidified matrix, thereby reducing the overall concentration of leachate contaminants to an acceptable low level.

These two technologies also had the lowest consumption of reagents for the solidification of various treated residues, among all alternative technologies considered. The lowest consumption of reagents will minimize the exposure of plant workers to dust and noise, minimize truck traffic for reagents transportation, minimize the quantity of solidified material and hence maximize land use, and minimize cost.

Figure 6.5
Pictorial Flow Diagram - Solidification
Source: Monenco (C8) Fig. 1



The present design of the solidification plant, however, provides flexibility to use other less preferred technologies, such as Portland cement/flyash, Portland cement/lime and Portland cement/clay for the high solids treatment system. This is done by providing storage silos and feed systems for many reagents required by the less preferred technologies. This arrangement ensures that specific residues can be treated by optimum formulations which may be available from the less preferred technologies, if considered beneficial.

d) Engineered Landfill

Landfilling operations will be carried out in the area between the central operating area and the perimeter buffer zone.

The landfill development will utilize the shallow entombed concept and a system of engineered devices which together with the natural hydrogeologic setting will provide the necessary control of the release of residual contaminants in the solidified mass to the surrounding environment in a manner which minimizes risk to human health and the environment.

Alternative landfill concepts and engineering devices were identified and evaluated in Monenco (C3), Chapters 2 and 3, which deal at length with these evaluations.

For these evaluations, subcriteria for each of the main criteria (listed in Table 6.2) were developed and are listed in Table 6.4.

The proposed landfill concept, engineering devices and operational aspects of landfilling are detailed in Monenco (C9), Chapter 4.

Table 6.4
Landfill Alternatives - Evaluation Criteria and Sub-Criteria
Source: Monenco (C9)

Criteria	Sub-Criteria	Criteria	Sub-Criteria
Performance	° Description of natural surface and ground water systems ° Impact on ground water flow ° Contaminant transport time to underlying acquifer ° Potential for off-site contamination resulting from lateral weathered zone flow ° Potential for direct surface water contamination ° Efficiency of land use ° Leachate produced ° Proven technology ° Long-term maintenance requirements	Flexibility	° Design flexibility - Concepts - Devices - Operations ° Sensitivity to changes in feed rate ° Sensitivity to changes to feed composition ° Turndown ° Site after use potential
		Safety	° Occupational risk during normal or up-set conditions ° Environmental risk on up-set conditions

Table 6.4 (continued)

Landfill Alternatives - Evaluation Criteria and Sub-Criteria

Source: Monenco (C9)

Criteria	Sub-Criteria	Criteria	Sub-Criteria
Reliability	° Regular maintenance requirements (during operations) ° Spares - Requirement - Availability ° Robustness ° Vulnerability to interruption of operations	Operations	° Complexity of process ° Off-site effects - Clay material Import/Export - Visual - Filling operations - Noise - Dust - Odour ° Ease of monitoring - Performance - Environmental
Commercial and Economic	° Capital ° Operations ° Closure ° Post-closure		

e) Design and Operating Features

In the shallow entombed landfill concept the solidified materials are placed below the active ground water flow zone associated with the upper level of weathered clay. This minimizes contamination of both the ground water and surface water, and minimizes reliance on engineered devices.

The devices incorporated in the design and placed over the underlying native clay base, include a 5 m cover of recompacted native clay and an underdrain system. These devices provide a high standard of short term performance as well as operating flexibility.

This combination of the shallow entombed concept and the engineered devices allows either active or passive operation. The underdrain system will not be operated unless leachate quality fails to meet approved standards.

The consultants concluded that the use of a synthetic liner would not add to the containment capability of the landfill, nor would its provision have any negative environmental impact. Consequently, provision of a synthetic liner is not being proposed. Although OWMC strongly agrees with the consultants' advice and does not feel a synthetic liner is necessary, it is prepared to incorporate a synthetic liner in the design should the Board so decide.

2. Capacity of Facility

The establishment of an appropriate size for the facility is an important activity which was carried on in parallel with the facility design work. A number of policy decisions by OWMC played a major role in the sizing discussion. These policies are:

- The facility shall have the capability of treating all types of special waste generated in Ontario (even though there is a much higher expectation of receiving priority wastes as described in Chapter 5).

- o The facility should be large enough to provide a positive impact on the special waste problem.

- o Facilities should be planned for easy modular expansion as markets develop.

- o Facilities must be capable of managing residuals from on-site and commercial treatment and recycling as these initiatives will be important in closing the management gap.

- o Facility planning should make allowance for expansion without major new capital investment if the market and regulations direct increased waste quantities to OWMC.

The basic intent of these policies is to introduce state of the art treatment technology into Ontario at a scale which will make a significant impact on the problem.

It was within this policy framework that the concept of the "waste management gap", introduced in Chapter 5, was applied. First, the approximate size of the gap was estimated separately for organic and for inorganic wastes. Second, with consideration to the sizing constraints of the technologies involved, OWMC decided on an initial facility capacity consistent with the policy.

a) Organic Wastes

The management gap for organic wastes was estimated at 300 000 t/a. The sizing of a rotary kiln to treat this waste depends upon the diameter needed to accommodate the feeding of liquids, sludges, solids and drums into the kiln. It is also dependent on the provision of a sufficient volume within the kiln to absorb the heat release from the waste. In consideration of these needs, OWMC selected a kiln with a capacity to treat 30 000 t/a. This size may be considered as minimum and is state of the art for kilns in operation in regional waste treatment facilities around the world.

From the standpoint of market impact, OWMC believes a kiln of this size is large enough to handle most of the priority organic wastes such as sludges, solids and refractory liquids. But the size selected also leaves ample room for the future expansion of waste reduction, on-site treatment, and off-site commercial treatment and recycling activities.

b) Inorganic Wastes

The management gap for inorganic wastes is estimated at 500 000 t/a. Inorganic waste treatment technology is very flexible in terms of capacity expansion. Therefore, OWMC decided that an initial capacity for physical/chemical treatment of 50 000 t/a based on eight hours per day, 5 days per week operation would be suitable. This capacity can be increased to 120 000 t/a by adding shifts.

The waste treatment market in Ontario does not presently have significant commercial capacity for inorganic waste treatment. Nevertheless, there is a large potential for the application of on-site treatment and waste reduction to these wastes. For this reason, OWMC has taken a conservative approach to the sizing of its inorganic treatment facilities. The selected size is expected to be large enough to provide service to those generators for whom on-site treatment is technically or economically impractical. Allowance has also been made for capacity to handle residuals from on-site treatment and waste reduction activities.

It is of interest to compare the OWMC sizing decision for inorganic facilities with that made for the Stablex facilities in Quebec. Even though the Quebec market for inorganic waste treatment is much smaller than the comparable market in Ontario, the Stablex facility was built with a 70 000 t/a, one-shift capacity and ultimate capacity of 210 000 t/a. The Quebec plant was underutilized for several years even with the import of some wastes from clean-ups in the northeastern United States. The Quebec experience suggests that the OWMC initial capacity of 50 000 t/a one shift capacity with immediate capability of handling

120 000 t/a nicely brackets the low and high ends of the range of probable inorganic waste receipts in the initial years of facility operation.

OWMC's decision on capacity can be nothing more than judgemental and speculative given the lack of specific data about waste quantities, sources and types; intended government policy on upgrading treatment of waste in the province and about waste generator intentions with respect to treatment of their wastes. However, the sizing is consistent with the concept of priority treatment and improvement by all aspects of the waste management market.

One thing, however, is clear. Without administrative or regulatory action by MOE which will require upgraded treatment of certain wastes, it is unlikely OWMC facility capacity as proposed in this plan stage EA will come close to being utilized. OWMC needs to know MOE's intentions about administrative or regulatory action and is pursuing this subject with MOE at the present time. Until MOE makes its intentions clear, OWMC can say little more about the capacity of its proposed facilities than is said above.

3. Optimization Issues

Once component technology selection and conceptual design decisions had been reached, a further stage of evaluation, called optimization, took place. Details of this stage for each of the four main process areas may be found in Monenco (C6), (C7), (C8), (C10), and Dillon/Monenco (C9). Two significant issues involving all process areas are addressed below.

a) Disposal of Liquid Effluent

One important aspect of the optimization described in the process area reports referred to previously was the effort to minimize the amount of treated effluent requiring disposal. Once all opportunities for recycle and reuse of such liquid effluents have been utilized, there may remain some excess quantities requiring

disposal. The options for disposal were categorized as on-site and off-site, as follows:

1. On-Site

   - o Injection into deep wells;
   - o Solidification;
   - o Evaporation.

2. Off-Site

   - o Pipeline;
   - o Truck haulage;
   - o Rail haulage.

An initial assessment of these effluent disposal options indicated that evaporation was technically and economically viable. The potential trace organic emissions from the vent stack would be several orders of magnitude lower than current Ontario standards allow.

The proposed facility design, therefore, provides for evaporation as a polishing step in the physical/chemical treatment plant.

b) Establishment of A Waste Profile

A second optimization issue affecting all process areas was the establishment of a waste profile. It is necessary not only to know the approximate capacity to which facilities should be designed, but also to have an understanding of the approximate proportions of wastes with different treatability characteristics in order to ensure that the right technologies are selected.

The process of establishing waste profiles, as carried out by OWMC is shown in Figure 6.6. The key points of the process are described below:

Figure 6.6
Development of Waste Profiles
Source: OWMC, 1986

- Basic estimates of the total quantities generated were provided by extrapolation of the Canviro survey database (DPA, B3);

- These profile estimates were then reviewed and modified on the basis of an assessment of the accuracy of the extrapolations and the consideration of other sources of special waste not covered by the survey data, such as:

  - commercial waste;
  - institutional waste;
  - biomedical waste;
  - stored waste (e.g. PCBs);
  - household hazardous waste;
  - wastes from contaminated site clean-ups;
  - wastes from hazardous material spill clean-ups.

- The potential for on-site treatment or for activities to eliminate larger waste streams was considered, as were the residual wastes expected from such on-site activities.

- Consideration was given to the potential for the effective recycling of wastes by commercial recyclers, such as oil re-refiners, solvent recyclers, pickle liquor recyclers, etc.

- An assessment was made of available off-site treatment capacity at existing commercial companies such as Tricil, Stablex, Energy Engineering, etc.

- Consideration was given to the extent to which the technologies proposed by OWMC have the potential to upgrade the quality of management of particular waste streams.

- Consideration was also given to the potential for environmental harm from poor management of particular waste streams.

- The potential for use of waste as a reagent or fuel was noted.

- o The possible effects of economic growth were taken into account.

An interim waste profile, resulting from this process was completed in May, 1984 and was used as the basis of much of the Phase 4A work by OWMC and its consultants.

In November, 1984, when the survey database was expanded by the addition of a further 500 companies, a second waste profile was developed. The November, 1984, Waste Profile is the basis for the Monenco (C1) and (C6 to C10). Table 6.5 provides a summary of this waste profile while the detailed estimate of particular wastes within each category is provided in Monenco, (C1) Appendix A.

The development of these waste profiles was an estimating procedure drawing upon the best available data and the best judgement of persons familiar with the waste management market. OWMC recognizes that there is a high potential for actual waste receipts at the facility to vary considerably from the estimated waste profile used in design. For this reason, OWMC instructed the engineering design team to incorporate maximum flexibility in the facility conceptual design to allow for variations in the types and quantities of special waste received.

The flexibility incorporated in the conceptual design as a result of these instructions has allowed OWMC to develop a market approach of focusing on those priority wastes for which proper treatment will provide the highest environmental benefit as discussed in Chapter 5.

i) Description of Environment Affected by Alternatives

Concurrent with the conceptual facility design and development process, OWMC was also conducting the site selection process. These two principal streams of activity were mutually dependent. During the site selection process, a series of assumptions were made about the characteristics of

Table 6.5
November 1984 - Waste Profile
Source: OWMC, 1984

CLASS 1 ORGANIC SLUDGE AND STILL BOTTOMS			
UCD 247	HALOGENATED STILL BOTTOMS	300	TONNES
248	STILL BOTTOMS	1,200	
252	SOL OR SLUD TANNERY WASTE	3,000	
257	PHENOLICS WASTES	1,000	
261	POLYMERIC RESINS	3,000	
263	OTHER POLYMERIC WASTES	2,000	
446	DEGREASING SLUDGE	1,000	
523	TANK BOTTOM SEDIMENTS	1,000	
520	EXPLOSIVES WASTES	0	
	TOTAL CLASS 1		12500
CLASS 2 SOLVENTS AND ORGANIC SOLUTIONS			
UCD 211	HALOG SOLV W HEAVY METALS	700	TONNES
212	HALOG SOLV W OTHER METALS	100	
213	OTHER HALOG SOLVENTS	500	
214	SOLV WITH HEAVY METALS	600	
215	SOLV W/O METAL/NON-METAL	300	
216	OTHER NON-HALOG SOLVENTS	300	
217	UNSPECIFIED SOLVENTS	1000	
221	ORG LIQUID METALS & HALOG	50	
222	ORG LIQUIDS W HALOG ONLY	5	
223	ORG LIQUIDS W HEAVY METAL	20	
224	OTHER ORGANIC LIQUIDS	200	
	TOTAL CLASS 2		3775
CLASS 3 OILS AND GREASES			
UCD 281	WASTE OIL & MIXED OIL	1000	TONNES
CLASS 4 OIL AND WATER MIXTURES			
UCD 283	OILY MUD,SEDIMENT & WATER	4000	TONNES
CLASS 5 ORGANIC AND OILY RESIDUALS			
UCD 264	THERMOSET WASTES	10	TONNES
282	OILY TANK BOTTOMS	500	
284	OILY ACIDIC SOLIDS	2000	
285	OILY ALKALINE SOLIDS	10	
286	OIL/WATER SEPARATOR SLUDG	300	
288	OILY WASTES W HEAVY METAL	1000	
289	OILY WASTES WITH WATER	3000	
447	TETRAETHYL LEAD SLUDGE	5	
	TOTAL CLASS 5		6825
CLASS 6 HEAVY METAL SOLUTIONS AND RESIDUALS			
UCD 111	ACIDIC SOL W HEAVY METALS	8000	TONNES
112	ACIDIC SOL METAL/NON-META	4000	
113	OTHER ACIDIC SOLUTIONS	3000	
121	ALKA SOL W HEAVY METALS	10000	
122	ALKA SOL METAL/NON-METALS	500	
123	OTHER ALKALINE SOLUTIONS	3700	
131	METAL FINISHING SOL,ACID	1500	
132	METAL FINISHING SOL,ALKA	500	
133	SPENT PICKLE LIQUOR	2000	
141	AQ.SOL. WITH HEAVY METALS	10000	
142	AQ.SOL. WITH OTHER METALS	7000	
143	AQ.SOL. W REACTIVE ANIONS	2500	
244	PHOTOCHEMICAL WASTES	500	
251	TANNERY WASTES - LIQUID	2000	
431	HEAVY METAL SLUDGE	15000	
433	OTHER METAL SLUDGES	2000	
445	PLATING OR METAL FIN SLUD	2000	
523	TANK BOTTOM SEDIMENTS	1000	
	TOTAL CLASS 6		75200
CLASS 7 MISCELLANEOUS CHEMICALS AND PRODUCTS			
UCD 145	CONTAMINATED BRINE	10	TONNES
152	INORGANIC SOLID CHEMICALS	2000	
243	PHARMACEUTICAL WASTES	200	
245	OFF-SPEC.OR AGED ORGANICS	500	
416	INK SLUDGE	200	
513	LAB. WASTE CHEMICALS	200	
	TOTAL CLASS 7		3110
CLASS 8 PAINT AND ORGANIC RESIDUALS			
UCD 254	ADHESIVES OR GLUE	500	
258	WASTE TAR AND RESIDUES	2200	
262	LATEX WASTES	500	
454	PAINT SLUDGE	2000	
455	PAINT SLUD NO HEAVY METAL	500	
	TOTAL CLASS 8		5700
CLASS 9 AQUEOUS SOLUTIONS WITH ORGANICS			
UCD 225	AQ.SOL <10% ORG.RESID.	1500	TONNES
226	AQ.SOL <10% HALOG. RESID.	10	
227	AQ.SOL >10% ORG. RESID.	500	
228	AQ.SOL >10% HALOG. RESID.	10	
	TOTAL CLASS9		2020
CLASS 10 ANIONS COMPLEXES			
UCD 146	SOL CONTAINING CYANIDE	800	TONNES
147	SOL CONTAINING SULFIDES	10	
444	CYANIDE BEARING SLUDGE	400	
	TOTAL CLASS 10		1010
CLASS 11 SLUDGES AND INORGANIC RESIDUALS			
UCD 151	INORGANIC SOLIDS	10000	TONNES
165	SPENT CATALYST	200	
167	OTHER INORGANIC WASTE	3000	
417	ALUM AND GYPSUM SLUDGES	100	
441	LIME SLUDGES	15000	
443	SULFUR SLUDGE	10	
509	GAS CYLINDERS	5	
518	DUST COLLECTOR WASTE	2000	
	TOTAL CLASS 11		30315
CLASS 12 PESTICIDE AND HERBICIDE WASTE			
UCD 241	PESTICIDES AND WASTES	150	TONNES
532	CONTAM EQUIP & CONTAINERS	50	
	TOTAL CLASS 12		200
CLASS 13 PCB WASTES			
242	PCB OIL HIGH STRENGTH LIQ	40	TONNES
CLASS 14 CLEAN UP RESIDUALS			
UCD 512	SPILL CLEANUP	700	TONNES
521	SPENT CARTRIDGE FILTERS	700	
528	PATHOLOGICAL WASTES	700	
531	CONTAMINATED RAGS	700	
	TOTAL CLASS 14		2800
	TOTAL PROFILE	148,485	TONNES

the facility components and the possible effects of placing them in various environmental settings. Such assumptions described the environment at the more local level at this stage of analysis [Site Selection Process, Phase 3B - Selection of a Preferred Site(s) - Site Selection; 1986, Vol. 1, Appendix A, Table A1.2 by M.M. Dillon (D5)].

In addition, another aspect of the environment which can be potentially affected by the alternatives is the waste treatment market described in Chapter 3 of this Environmental Assessment.

ii) Prediction of Effects of the Alternatives

The criteria listed in Table 2 were used by Monenco in the evaluation of component technologies. They were derived from OWMC's three facility development goals, design and operation principles and policies. Higher weighting factors were given to the first four evaluation criteria which were related to environmental considerations. These four criteria, namely; performance, safety, flexibility and reliability, had a combined weighting of 75 out of a maximum of 100. This approach ensured that the selection of component technologies and conceptual design of various process areas would result in a facility that would pose minimum risk to human health and minimum impact on the environment.

iii) Mitigation or Changes and Improvements of the Alternatives

Optimization is the term used by Monenco to describe the process of mitigation, changes, or improvements made to the process areas for incineration, physical/chemical treatment, solidification and engineered landfill.

Having selected the component technologies and component systems for four major process areas, the process systems for

each of the process areas were optimized. Optimization of facility design comprises two activities:

- o the enhancement of positive effects and benefits by maximizing the efficiency and effectiveness of a chosen process system;

- o the mitigation of potential negative effects by minimizing the potential risk to the environment and human health in facility layout, system design, and method of operation.

Once optimized, the net effects for each process system were identified.

iv) Net Effects of Alternative After Mitigation

The expected performance of the incineration plant is discussed on pages 212-222 of Monenco (C6). It describes flue gas emissions, destruction of organics, specific emission data, absolute emissions, compliance with Ontario regulations and risk analysis, and solid residues.

Table 6 of Monenco (C6) gives the expected quantities of contaminants discharged from the stack to the atmosphere.

Environ and ORF are currently investigating the health risks associated with the incineration plant emissions and their compliance with Ontario Regulations, respectively.

The performance of the physical/chemical treatment plant is discussed on pages 176-215 of Monenco (C7) It addresses the removal of both inorganic and organic contaminants. The expected evaporation emissions are given in Table 25 of the same report.

Environ and ORF are also investigating the health risks associated with evaporator emissions and their compliance with Ontario Regulations.

CONCLUSION

The components of the treatment and disposal facilities were selected by means of this technology evaluation process, and subsequently integrated in a conceptual design. This design is fully described in Monenco (C1) and is summarized in Chapter 8 of the EA. The treatment and disposal of special waste by the selected technologies of the conceptual facility design will minimize the risk to human health and the environment, because of their efficiency and effectiveness.

Chapter 7:
Alternative Methods - Site Selection

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A. INTRODUCTION

Chapter 7 describes the process used by OWMC to identify a preferred site for the proposed facilities described in the previous chapter.

Originally, OWMC was requested by the Government to develop treatment and disposal facilities at a site in South Cayuga. After reviewing preliminary geologic and hydrogeologic studies, however, OWMC recommended that the South Cayuga site be rejected. As a result of its rejection, OWMC embarked on a search for a new site. The steps OWMC followed in the process of selecting a new site are outlined in Table 7.1 as are the phases in OWMC's Facilities Development Process (FDP) that correspond to these steps. Figure 7.1 illustrates this step-by-step approach.

This chapter describes steps one through four. The suitability of the preferred site will be determined when the Phase 4B site assessment work is complete.

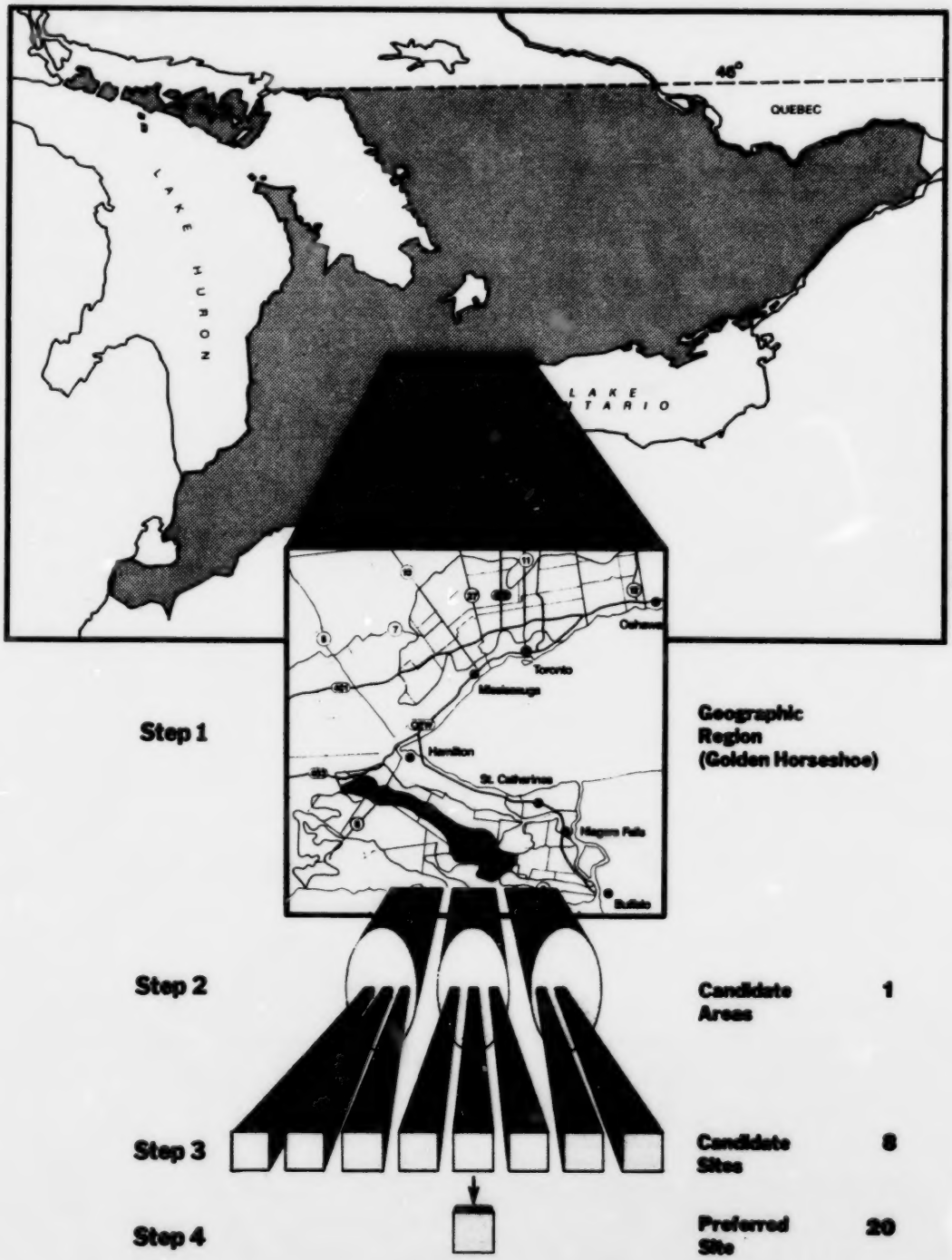
Chapter 7 is a summary of several reports which should be consulted for additional detail. These reports are filed with, and form part of this chapter. These reports are:

OWMC	Facilities Development Process - Phase 1 Report 1982 (D1)
OWMC	Facilities Development Process - Phase 2 Report 1983 (D2)

Table 7.1
OWMC Site Selection Process
Source: OWMC, 1986

Site Selection Steps	FDP Phases
Preliminary Public Consultation and Information Gathering	1
Step 1: Narrow the search to a geographic region in Ontario	2
Step 2: Identify candidate areas suitable for each facility component within this geographic region	3A
Step 3: Identify candidate sites within candidate areas	3B
Step 4: Evaluate candidate sites and select preferred site	4A
Step 5: Assess suitability of preferred site	4B

Figure 7.1
Step-by-Step Approach to Site Selection
Source: OWMC, 1986



OWMC	Map Portfolio, Phase 3 Interim Report 1983
M.M. Dillon Limited	Interim Phase 3 Technical Report - Site Selection 1986 (D3
Gartner Lee Associates Limited	Hydrogeologic Considerations for Facilities Siting 1983 (D4)
M.M. Dillon Limited	Site Selection Process, Phase 3B Selection of Candidate Sites - Site Selection 1984 (D5)
M.M. Dillon Limited	Site Selection Process, Phase 4A - Selection of a Preferred Site(s) - Site Selection 1986 (D6)
Environ Corporation	Site Selection Process, Phase 4A - Selection of a Preferred Site(s) - Generic Risk Assessment 1985 (D7)

A multidisciplinary approach was applied in the site selection process. Specialist consultants produced supporting technical reports in each discipline studied. The results of these are incorporated into the reports filed.

1. Site Selection Goals and Objectives

The goals developed and adopted by OWMC to guide the site selection process are described in the Dillon site selection reports (D3, D5 and D6) and are briefly outlined below in order of priority.

1) To Minimize Risk to Human Health

The general reasoning used in the site selection process was - where a choice exists it is preferable to select sites which can, by virtue of their characteristics and location, further contribute to the minimization of risk.

2) Minimize Environmental Impact

A second goal of the site selection process was to avoid, or at least minimize, adverse environmental impacts, particularly

those potential impacts which are the most significant and the least amenable to mitigation.

3) Minimize Financial Costs to OWMC and to the People of Ontario

In the site selection process the third goal encompasses the consideration of such potential areas of cost as: transportation, site acquisition, on-site and off-site development and facility operations. Throughout the process, this goal has been subordinate to the first two goals.

Site selection objectives are a refinement and elaboration of these goals. They were developed to help shape and direct the process. They are listed and discussed in Dillon (D5) Appendix A, Table A1.1.

2. Site Selection Principles

Besides these goals and objectives, OWMC identified several general principles to guide the process, namely:

1) Progressive Refinement of the Search Process

The process was to evolve in a series of steps involving the evaluation of alternatives and the narrowing of geographic focus.

2) Protection of Human Health and the Environment

The primary considerations were protecting human health and the environment.

3) The Involvement of Those Affected

Since OWMC was committed to a thorough consultation program, affected agencies, organizations, and the public would be consulted at key decision points.

4) Efficiency and Effectiveness

The costs and time involved in conducting a detailed analysis and evaluation of every conceivable site across the entire province would clearly have been prohibitive. OWMC would have to use its resources effectively and efficiently to conduct a systematic search and selection process focusing on critical concerns and providing definite conclusions within a reasonable time and cost frame.

5) A Second Natural Level of Protection for the Environment

OWMC considered it essential to identify a site which would provide a second level of protection for the environment, beyond that provided for by the design and operating procedures.

6) Likelihood of Suitability

OWMC would have to look especially carefully at areas or sites expected to show the greatest suitability when more detailed investigations were undertaken.

7) Maintenance of Choice

As it made decisions to exclude possible areas or sites, OWMC would have to take care to ensure that no significant or unique alternatives were discarded.

8) Definition of the Environment

The very broad and inclusive definition of the environment used in the Ontario Environment Assessment Act (1975) would be adopted by OWMC.

The site selection principles are treated at length in the Dillon site selection reports (D3, D5 and D6).

3. Facilities Characteristics Assumptions

During the site selection process the site selection team had to make a series of assumptions about the characteristics of the facility components (described in Chapter 6) and the possible effects of placing them in various environmental settings. For instance, in considering any site near an airport as a possible location for an incinerator, the site selection team had to determine whether the incinerator stack would interfere with airport operations.

The assumptions employed in Phase 3B are listed in Dillon (D5) Volume 1, Appendix A, Table A1.2, while those for Phase 4A are listed in Dillon (D6) Volume 1, Appendix A, Table A.2. Assumptions made about facility components for the first two site selection steps are listed in OWMC (D1 and D2) and Dillon (D3).

B. NARROWING THE SEARCH

Following the rejection of the South Cayuga site late in 1981, OWMC initiated a search for a new site or sites. The search proceeded on the basis that OWMC's waste management system would consist, at a minimum, of incineration, physical/chemical treatment including solidification and a secure landfill. OWMC began its search for possible sites by defining a study area.

1. Definition of the Study Area

The following factors were instrumental in the designation of the study area.

i) Hydrogeology

OWMC determined that a secure special waste treatment and disposal site requires hydrogeologic conditions that will naturally contain contaminants in the event of an accidental release or spill. Suitable hydrogeologic conditions are indicated

by soil depth, texture and uniformity. The greater the depth, the finer the texture and the more uniform the soil in an area, the greater is the ability to contain contaminants, the more predictable is the movement of ground water and the longer the lead-time available to implement remedial measures.

ii) Transportation

The risks and costs of transporting special waste increase with the distance travelled. OWMC therefore determined that to minimize transportation risks and costs, the waste management facilities should be located as close to the major waste generation areas as possible.

The combined influence of these two factors led OWMC to designate Southern Ontario as the study area. Since Southern Ontario offered a high probability of locating sites with suitable hydrogeologic conditions, and since most special waste is generated in Southern Ontario, OWMC concluded that the search should focus there. The study area was defined formally as that part of Ontario south of latitude 46°N, which runs just south of North Bay.

2. Rationale for Narrowing the Search to the Selected Geographic Region

Having defined a study area, OWMC began to gather pertinent information for further narrowing the search.

a) Phase 1 Studies

The primary information studies carried out in Phase 1 of the Facilities Development Process consisted of preparing an inventory of environmental, engineering and planning factors. These studies are listed in OWMC (D1) Appendix D. As a result of the Phase 1 studies, two factors emerged as significant in further narrowing the search. These were (i) Geology/ Hydrogeology and (ii) Transportation. It was determined that the other factors inventoried in Phase 1 would be dealt with more

effectively at a later, more site-specific phase of the site selection process.

i) Geology/Hydrogeology

OWMC commissioned Gartner Lee Associates Limited (GLAL) to review and evaluate the geologic/hydrogeologic character of Southern Ontario[1]. The study was undertaken because OWMC had determined that to avoid total reliance on engineered containment systems it would be necessary to locate facilities in those areas of Southern Ontario where the geologic/hydrogeologic setting affords natural protection and containment in the event of an accidental spill or an unforeseen engineering failure.

The study divided Southern Ontario into 261 geologic/hydrogeologic units. Each region was then placed in one of six categories or "zones", depending on the natural ability of the terrain to protect ground water resources from contamination. Of these six zones, two were considered to have potential to naturally restrict contaminants. These were designated Zones 1 and 2. The study concluded that:

"Zone 1 appears to have the most predictable and uniform subsurface conditions for naturally restricting contaminant movement. It is expected that adequate contiguous areas could likely be found and proven to be suitable within any of the regions identified in Zone 1.

Zone 2 identifies those regions where variability exists, but this terrain may locally provide containment of potential contaminants. It will be more difficult and more costly to isolate adequate contiguous areas within these regions compared with the regions in Zone 1. Within some of these regions, suitable sub-surface conditions may indeed not be available.

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[1] Gartner Lee Associates Limited, Primary Environmental Information, Part 1, Geological/Hydrogeological Inventory, 1982.

> Zones 3, 4, 5 and 6 have the least potential for the discovery of naturally suitable lands for waste facilities development. Within the regions located in those zones it is likely that total reliance on engineered systems to contain contaminants will be required."[1]

OWMC concluded that since Zones 1 and 2 offered the best potential for finding a site or sites containing soil of a depth, texture, and uniformity that would provide an environmentally acceptable site, the search should focus on these two zones.

Figure 7.2 illustrates the hydrogeologic zones in the study area.

ii) Transportation

Since the risks and costs of transporting special waste increase with the distance travelled, OWMC resolved to place the treatment facilities as close to major waste generation areas as possible. Waste quantities studies commissioned by OWMC indicated that approximately 70 percent of all special waste is generated in south central Ontario, most of it concentrated in the highly industrialized region around the western end of Lake Ontario, an area commonly known as the Golden Horseshoe region [P&R (B1)]. Figure 7.3 shows where special waste is generated in Ontario.

b) Definition of the Geographic Region

The combined influence of the Geology/Hydrogeology and Transportation factors led OWMC to narrow its search to hydrogeologic Zones 1 and 2 within the Golden Horseshoe region. The first factor restricted the search to hydrogeologic Zones 1

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[1] Gartner Lee Associates Limited, Primary Environmental Information, Part 1, Geological/Hydrogeological Inventory, 1982, pp.19-20.

Figure 7.2
Hydrogeological Inventory for Waste Facilities Development - Southern Ontario
Source: OWMC (D1)

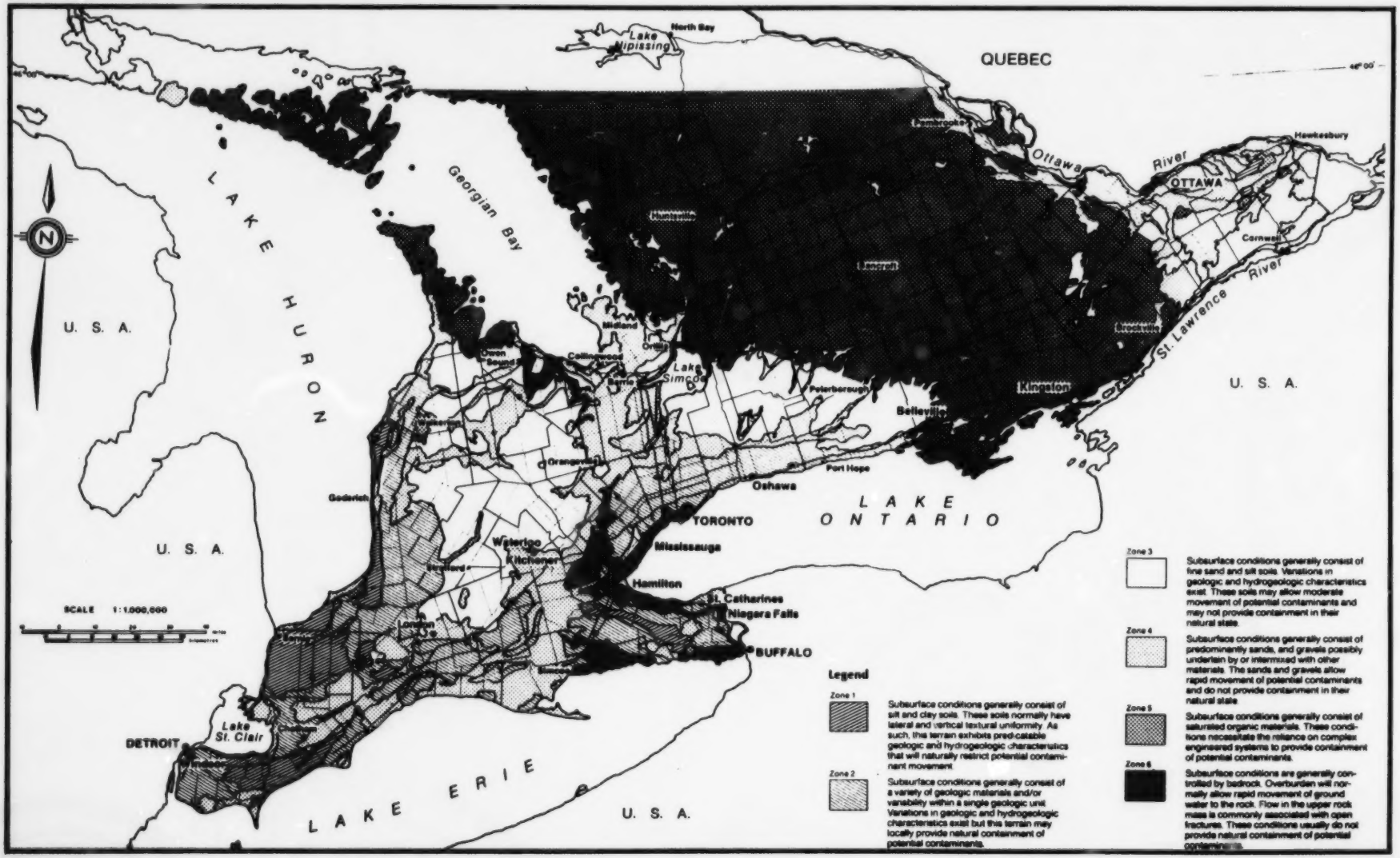

QUEBEC
North Bay
Lake Nipissing
LAKE HURON
Georgian Bay
U. S. A.
Ottawa River
OTTAWA
Hawkesbury
Cornwall
St. Lawrence River
Kingston
Peterborough
Belleville
Lake Simcoe
Midland
Barrie
Orangeville
Port Hope
Oshawa
TORONTO
LAKE ONTARIO
Mississauga
Hamilton
St. Catharines
Niagara Falls
BUFFALO
Waterloo
Kitchener
Guelph
Goderich
London
DETROIT
Lake St. Clair
LAKE ERIE
SCALE 1:1,000,000
Legend
Zone 1
Subsurface conditions generally consist of silt and clay soils. These soils normally have lateral and vertical textural uniformity. As such, the terrain exhibits predictable geologic and hydrogeologic characteristics that will naturally restrict potential contaminant movement.
Zone 2
Subsurface conditions generally consist of a variety of geologic materials and/or variability within a single geologic unit. Variations in geologic and hydrogeologic characteristics exist but this terrain may locally provide natural containment of potential contaminants.
Zone 3
Subsurface conditions generally consist of fine sand and silt soils. Variations in geologic and hydrogeologic characteristics exist. These soils may allow moderate movement of potential contaminants and may not provide containment in their natural state.
Zone 4
Subsurface conditions generally consist of predominantly sands, and gravels possibly underlain by or intermixed with other materials. The sands and gravels allow rapid movement of potential contaminants and do not provide containment in their natural state.
Zone 5
Subsurface conditions generally consist of saturated organic materials. These conditions necessitate the reliance on complex engineered systems to provide containment of potential contaminants.
Zone 6
Subsurface conditions are generally controlled by bedrock. Overburden will normally allow rapid movement of ground water to the rock. Flow in the upper rock mass is commonly associated with open fractures. These conditions usually do not provide natural containment of potential contaminants.

Figure 7.3
Special Waste Distribution in Southern Ontario (Estimated)
Source: OWMC (D1)

and 2; the second pointed to the Golden Horseshoe region where the majority of special waste is generated.

The defined geographic region provides good potential for finding a hydrogeologically suitable site because it contains Zone 1 land which is expected to have the most predictable and uniform soil conditions for naturally restricting contaminant movement and Zone 2 land which also provides good opportunity for finding a suitable site. The decision to focus the search in an area with good potential for finding a hydrogeologically suitable site was consistent with public concern expressed at the regional meetings and meetings of the provincial network groups convened by OWMC in Phases 1 and 2. The participants at these meetings were concerned with the potential of contamination of ground water at the facility.

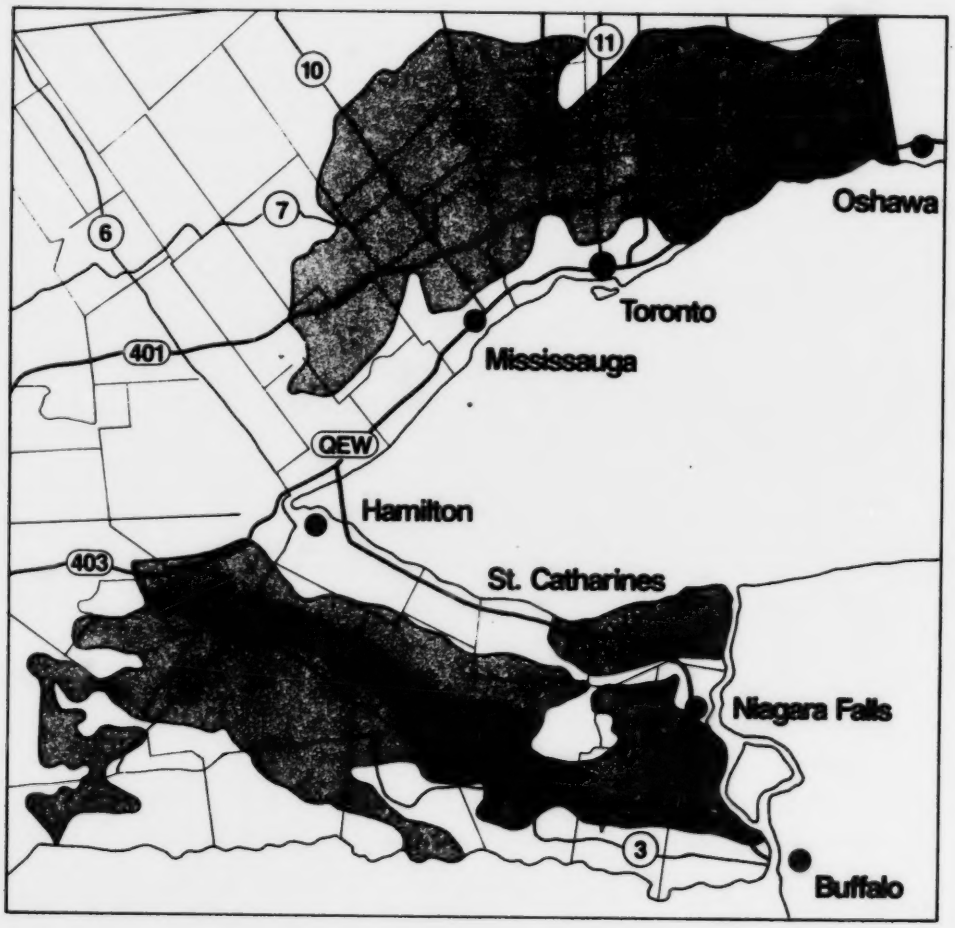
The decision to narrow the search to the Golden Horseshoe region, as close as possible to where the bulk of wastes is generated in Ontario, was also consistent with public concern expressed at these meetings. The participants were overwhelmingly concerned with the risks involved in transporting special waste over long distances.

The geographic region was further refined by OWMC by setting the eastern boundary between Whitby and Oshawa and excluding Zone 2 land to the north and west. OWMC decided, upon the advice of its consultants, that there was nothing to gain from searching further east of the Whitby area. The potential for finding suitable hydrogeologic conditions does not improve moving eastward and movement eastward from Toronto increases the distance from the concentration of special waste generation, thus increasing transportation risks and costs. Similarly, the Zone 2 land north and west of the geographic region offers no better chance of finding suitable hydrogeologic conditions or measurable reduction in transportation risks and costs.

The selected geographic region is shown in Figure 7.4.

Figure 7.4
Selected Geographic Region

Source: OWMC (D2)



Zone 1

Subsurface conditions generally consist of silt and clay soils. These soils normally have lateral and vertical textural uniformity. As such, this terrain exhibits predictable geologic and hydrogeologic characteristics that will naturally restrict potential contaminant movement.

Zone 2

Subsurface conditions generally consist of a variety of geologic materials and/or variability within a single geologic unit. Variations in geologic and hydrogeologic characteristics exist but this terrain may locally provide natural containment of potential contaminants.

Note:	Only the shaded zones will be studied for candidate areas and site selection.

C. IDENTIFICATION OF CANDIDATE AREAS

The second step in the process was to identify broad areas within the geographic region in the Golden Horseshoe that would be suitable for the detailed analysis needed to select candidate sites. Areas suitable for the location of one or more facilities were identified as candidate areas.

1. Factor Identification

Factors were chosen either:

1) To identify suitable or unsuitable areas within the Golden Horseshoe; or,

2) To ensure that no significant or unique alternatives were being discarded.

Two classes of factors were used to identify candidate areas:

1) Environmental factors dealing with the routes or pathways through the environment by which human exposure to contaminants might occur. Four such pathways were identified: air dispersion, hydrogeology, surface water, and transportation;

2) Land use and population factors dealing with risk to human health (for example, by considering population densities) and dealing with potential impacts on land resources (for example, agricultural land). These factors also ensured that a range of choice was maintained regarding land resource use and land ownership siting considerations.

The factors employed and the rationale/significance for each factor are provided in Dillon (D3) Table 2.1, pp.15-17.

The Phase 3A public consultation program influenced the selection of factors used to identify candidate areas and factors used in subsequent steps. For example, the public commented on the need

to consider proximity to waste generators. Accordingly, this was adopted as a factor in candidate area identification (i.e. travel time from the theoretical centre of waste generation). The role of public consultation in candidate area identification is documented in Dillon (D3) Appendix D.

2. Data Collection and Analysis

Once the consultants had drawn up a list of factors to use in identifying candidate areas, they began an extensive process of data collection, analysis, and mapping to provide the needed information base. This involved a detailed review of available information and statistics (e.g. Canada Land Inventory maps and census data), air photo interpretation, and reviews of documents on file with various ministries and agencies. The result was a series of data maps on a regional scale.

3. Factors - Characteristics and Distinctions

The chief characteristics of each factor used to define candidate areas and the main distinctions within them are outlined in Dillon (D3) Chapter 3 and briefly described below.

a) Hydrogeology

Gartner Lee Associates Limited (GLAL) prepared a report for OWMC on geologic and hydrogeologic considerations for siting facilities for the management of industrial wastes. The report, Hydrogeologic Considerations for Facilities Siting 1983 (D4), sets out basic concepts about how contaminants move in the hydrogeologic environment, outlines some assumptions concerning facility characteristics and wastes, and reaches some general conclusions and recommendations about siting requirements for the three facility components. It recommends giving first consideration to those areas of the Golden Horseshoe that are believed to contain the thickest deposits of uniform fine textured soils.

To assist in the identification of candidate areas, additional geologic and hydrogeologic investigations were undertaken by GLAL. These resulted in the production of a seven-level hydrogeologic classification system map (OWMC (MP) Map 3). The classification system reflects differences in the depth and uniformity of soils and was used to identify areas which should be given a higher priority of study.

b) Atmospheric Dispersion

The Ontario Research Foundation (ORF) provided information on atmospheric dispersion in the Golden Horseshoe area. The specific components of their study included a description of how lake breezes, urban heat islands, and topography might affect the dispersion of emissions, a rationale for using air dispersion constraints in identifying incinerator sites, and a constraint map (OWMC (MP) Map 4) showing where those constraints are to be found in the Golden Horseshoe.

c) Surface Water

The surface water study sought to identify candidate surface water receivers for treated waste water from the proposed facilities. It considered both important uses of surface water and its dispersion characteristics.

d) Transportation

In this study, areas within the selected geographic region were compared on the basis of access to transportation. This was done by plotting travel time both from the theoretical centre of waste generation and from 400-series highways. OWMC (MP) Map 6 plots the travel times.

e) Agriculture

Much of the selected geographic region is used for agriculture.

The report dealt with:

i) soil capability for common field crops;
ii) specialty agricultural crops; and
iii) use-intensity and economic performance of agriculture as illustrated by:

   a) percentage of township or municipality area occupied by census farms,
   b) average values of gross farm sales,
   c) average capital values of farm operations.

OWMC (MP) Map 7, "Soil Capability for Agriculture", and Map 8, "Agricultural Land Use, Productivity, and Investment", highlight the agricultural characteristics of the selected geographic region.

f) Publicly-Held and Industrially-Designated Lands

Industrially-designated lands were identified and mapped on the basis of all industrial land use designations in approved official plans and their amendments. Publicly-held parcels of about 20 ha or more were also identified and mapped. These lands are shown on OWMC (MP) Map 10.

g) Urban Built-Up Areas

The study identified all built-up areas both within and adjacent to the selected geographic region. These were considered inappropriate locations for facility components, since they could not be used without displacing existing structures. Care was taken to include in the built-up areas only those vacant and rural lands which were completely surrounded by urban development to maintain as great a range of potentially suitable sites as possible; wherever possible, rural or vacant properties on the edge of the urban areas were retained for further consideration, as were vacant lands within built-up areas designated for industrial use. OWMC (MP) Map 9 marks urban built-up areas.

h) Rural Population Densities

Rural population densities were mapped in order to ensure that a range of siting options was maintained, and that areas of lower rural population density which might otherwise have been suitable were not being ruled out. OWMC (MP) Map 9 identifies rural population trends.

4. Candidate Area Identification Process

The candidate areas were identified using a series of overlay maps representing the factors described above. After determining the role each factor ought to play, the consultants used various combinations of maps to rule areas out for one or more facility components. The combination of facility components considered is listed in the Dillon (D3) p.13.

This process of selecting candidate areas is treated at length in Dillon (D3) Chapter 4, but can be summarized as follows:

Stage 1 Determine which factors are to be used to exclude areas and which are not.

Stage 2 Identify areas to be excluded from consideration for all components, employing hydrogeology, air dispersion, transportation, specialty agriculture, and urban built-up areas as factors

Stage 3 Rule out areas for individual components based on soil depth and soil variability requirements for the landfill, and air dispersion constraints for the incinerator, rule out areas for individual components.

Stage 4 Complete the maintenance of choice analysis.

5. Rationale for Excluding Areas

The lower priority areas of the selected geographic region that were ruled out for all facility components are shown on OWMC (MP)

Map 1. The reasons for excluding areas are presented in and are summarized in Table 7.2 and discussed below.

A-Areas: Hydrogeologic Constraints

The A-areas were initially assigned a low priority of study because they offer a poor chance of finding a suitable site for any component. Although the geologic composition and subsurface conditions vary greatly, most of them have less than 10 m of silt-clay soil, which OWMC set as the minimum needed to ensure a second level of protection for the physical/chemical treatment plant and incinerator. A minimum of 20 m was set for the engineered landfill.

Much of the A-area (OWMC (MP) Map 1) was identified at the outset as the poorest choice for facility siting because of its complex and variable soil conditions. The likelihood of finding suitable soil conditions there was thought to be low, given that subsurface sand was known to occur at several levels. When the rest of the selected geographic region was studied in more detail, the remaining A-areas were identified.

When the characteristics of the candidate areas were reviewed, however, it became apparent that only small parcels of publicly-held and industrially-designated land would remain for later analysis if area A-1 were excluded at this stage. Strong preference had been expressed in public consultation for siting the facilities on this type of land, if at all possible. OWMC, therefore decided to proceed with more detailed hydrogeologic investigations for Area A-1 to afford the best possible chance of identifying candidate sites on non-agricultural land.

B-Areas: Air Dispersion and Specialty Agriculture Constraints

Atmospheric dispersion is a significant constraint in the B-areas shown on OWMC (MP) Map 1. Although this factor is particularly important for the incinerator, it is also a consideration for the physical/chemical treatment plant and the landfill.

Table 7.2
Reasons for Exclusion

Source: M.M. Dillon (D3)

TYPES OF AREAS EXCLUDED	HYDROGEOLOGICAL CONDITIONS	ATMOSPHERIC DISPERSION			TRANSPORTATION CONSIDERATIONS		SPECIALTY AGRICULTURE	MAJOR BUILT-UP AREAS	OTHER CONSIDERATIONS
		LAKE BREEZE	TOPOGRAPHIC FEATURES	URBAN HEAT ISLANDS	PROXIMITY TO 400 SERIES HIGHWAYS	REGIONAL ACCESS			
A	●								
B		●	●	●			●	○	No unique advantage
C	○				●	○			No unique advantage No industrially designated or publicly held land
D				○				●	

● **Primary**
○ **Secondary**

The two B-areas east and west of St. Catharines have a combination of air dispersion constraints, and also a heavy concentration of specialty agriculture together with high rural and urban population densities. For those reasons, and since more suitable areas were available in the same vicinity, it was decided to exclude these two areas.

Other B-areas include three narrow strips of land along the Niagara River subject to lake breezes. These also offered no offsetting benefits compared with nearby candidate areas.

C-Areas: Transportation Constraints

Two transportation indicators were employed: travel time from the theoretical centroid of waste generation for Southern Ontario and travel time from the 400-series highways. Only the latter, however, was used to exclude areas. The 30-minute travel time contour eventually was selected as an appropriate criterion, and the lands beyond it were designated the C-area. Further study showed that this area offered no offsetting advantages compared with the more accessible candidate areas.

D-Areas: Urban Built-Up Areas

The D-areas are those that are completely built up as shown by aerial photography. At the outset these were considered as sites for a physical/chemical treatment plant alone. Once OWMC decided on an integrated or partially integrated facility (that is the physical/chemical treatment plant would be located with the landfill or with the incinerator), they were ruled out altogether.

6. Candidate Areas

The areas that remained after the above exclusions were identified as candidate areas. These are outlined on Figure 7.5 and on OWMC (MP) Map 2. Nineteen areas were identified, but further hydrogeologic investigation in Area A-1 subsequently led to the identification of the twentieth.

Figure 7.5
Candidate Areas Within the Geographic Region
Source: OWMC, Phase 3 Report, 1984

Legend — Components Included

- Physical/Chemical Treatment Plant Only
- Engineered Landfill & Physical/Chemical Treatment Plant
- Physical/Chemical Treatment Plant & Incinerator
- Integrated – All Components
- (5) Candidate Area Numbers

Miles 0 10 Kilometres 0 10

Some of these candidate areas were found to be potentially suitable for all facility components, others for only one or two. Normally, areas were ruled out for all facilities components if they lacked adequate soil depth requirements. A small area south of Lake Ontario with hydrogeolgically suitable soil, however, was ruled out. It abutted a large area of hydrogeologically suitable soils with comparable or better air dispersion, transportation, agricultural, and land use or land ownership characteristics. Any area showing a single air dispersion constraint (urban heat islands; lake breezes; or topography) was ruled out for the incinerator but retained for the landfill or the physical/chemical treatment plant if it showed offsetting desirable characteristics.

7. Comparison of Excluded Areas with Candidate Areas

The areas excluded were compared with those chosen to ensure that no areas with more suitable characteristics than the candidate areas were being overlooked, and that the resulting range of options for site selection would not be too narrow.

The following points emerged from this comparative evaluation:

- a majority of the excluded areas are clearly unsuitable for the siting of facility components based on the principles established in the search and selection process;
- although a few of the excluded areas have some desirable characteristics, some of the candidate areas also have these characteristics;
- the candidate areas offer a diversity of siting opportunities.

D. IDENTIFICATION OF CANDIDATE SITES

The third step in the site selection process was the identification of candidate sites. The purpose of this step was to identify a number of

candidate sites within the candidate areas. The identification of candidate sites occurred in three stages, as illustrated in Figure 7.6 and described below.

a) The Identification of Site Areas: Constraint Mapping

Site areas within the candidate areas were determined by identifying and then excluding areas considered unsuitable for the location of the three facility components - landfill, physical/chemical treatment plant and incinerator - by means of constraint mapping.

b) The Identification of Potential Sites: Site Screening

The screening stage began after constraint mapping had identified site areas warranting more detailed consideration. In this process, the remaining areas were progressively reduced in number and size until potential sites were identified.

c) The Comparison of Potential Sites and the Identification of Candidate Sites: Initial Comparative Evaluation

The initial comparative evaluation stage explored the relative differences among the potential siting options as a basis for reducing the number of potential sites under consideration to a short list of candidate sites.

1. **Site Area Identification Process**

The process by which site areas were identified is illustrated in Figure 7.7.

Constraint mapping was used to identify the site areas. This involved identifying factors that might pose constraints to development, gathering data, mapping these data, and finding which areas were not excluded by the constraints shown. Two sets of composite constraint maps were prepared: one for landfills and integrated facilities and one for the physical/chemical treatment plant and/or the incinerator. The difference in the siting requirements

Figure 7.6
Choosing Candidate Sites
Source: OWMC, Phase 3 Report,1984

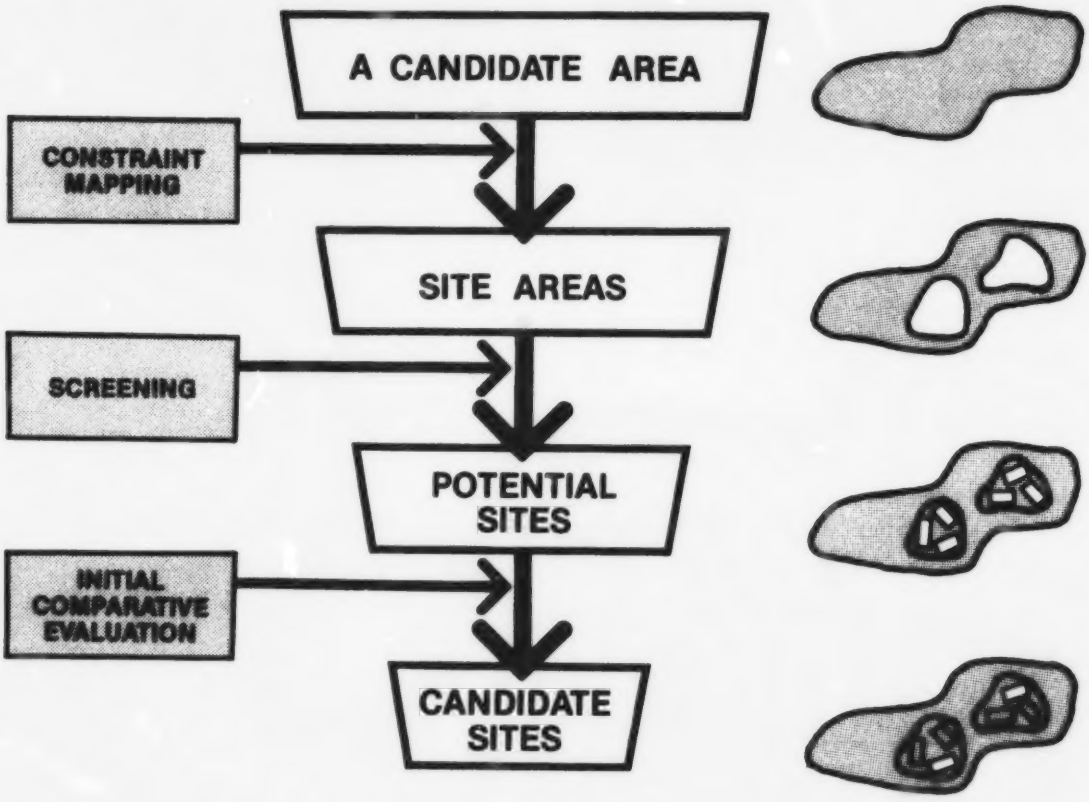
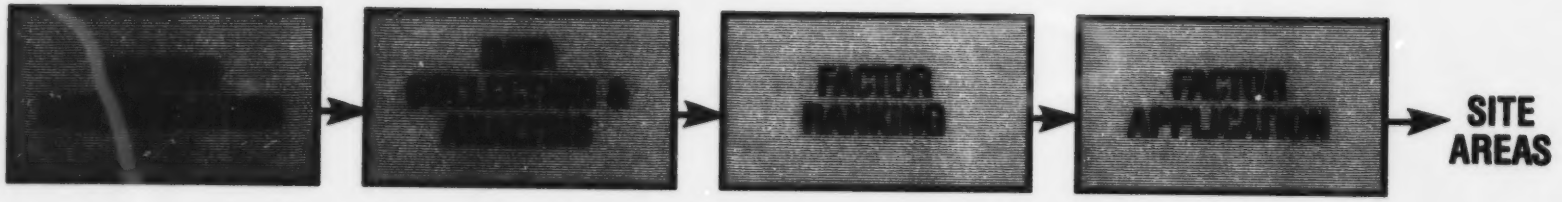


Figure 7.7
Site Area Identification Process
Source: M.M. Dillon (D5) Volume 1



for a landfill, compared to a physical/chemical treatment plant or an incinerator, necessitated the preparation of two sets of maps. These maps are Dillon (D5) Volume 4, Maps 3 to 12.

a) Factor Identification

Factors were determined by a review of OWMC's goals and objectives for site selection, its assumptions about facility characteristics, and the site selection principles. The factors were then further refined to incorporate the results of the data collection and analysis, to maintain a reasonably broad choice, and to reflect agency and public concerns[1]. A list of the factors is provided in Dillon (D5) Volume 1, Table 3.1, pp.32-4, and Appendix B, Table B2.1.

b) Data Collection and Analysis

Having identified the factors, the site selection team undertook an extensive process of data collection, analysis, and mapping to provide the needed information base. The data collection and analysis included a review of available information and statistics; contacts with Federal, Provincial and Municipal officials; preliminary field checks; and air photo interpretation. Ministries and agencies, private corporations, and recognized experts were also consulted, to obtain relevant data and to discuss how they should be analysed and interpreted. The result was a series of 1:50 000 scale factor maps.

c) Factor Ranking

The factors used to identify site areas were not all of equal importance. They had to be ranked in terms of the site selection

[1] The role of OWMC's public consultation program in the identification, ranking and application of factors in Phase 3B is presented in Appendix B.4 of Dillon (D5) Volume 1, pp.B.73-B.94.

goals, objectives, and principles. Ministry agency and public concerns were also incorporated in the development of factor ranking. Factors were ranked in a two-step process. Initially, the factors were ranked within disciplines by the consultants responsible. These individual consultant rankings were then combined into an overall multidisciplinary ranking of factors. The need for an overall ranking of factors was based on the recognition that, for example, a biological factor of lowest constraint would not necessarily be equivalent to an agricultural factor of lowest constraint.

Four ranking levels were established, ranking from 1 (low constraint) to 4 (high constraint), as follows:

Level 1 - Factors representing positive siting considerations.

Level 2 - Factors representing potentially suitable siting considerations.

Level 3 - Factors more constrained than Levels 1 and 2 but less constrained than Level 4.

Level 4 - Factors representing severe potential constraints.

The overall ranking and reasons for the ranking appear in Dillon (D5) Volume 1, Appendix B, Tables B3.2 - B3.5.

d) Factor Application

After the ranking described above, the next step was to decide which factors should be treated as exclusionary and which as non-exclusionary, that is, which areas should be eliminated from further consideration and which should be carried forward to the next stage. The two sets of factors are listed in Dillon (D5) Volume 1, Appendix B, Tables B6.1 and B6.2. These tables also provide reasons for assigning factors to the two categories.

The factor application process relied on the factor rankings and involved five stages which are described in Dillon (D5) Volume 1, pp.44-78.

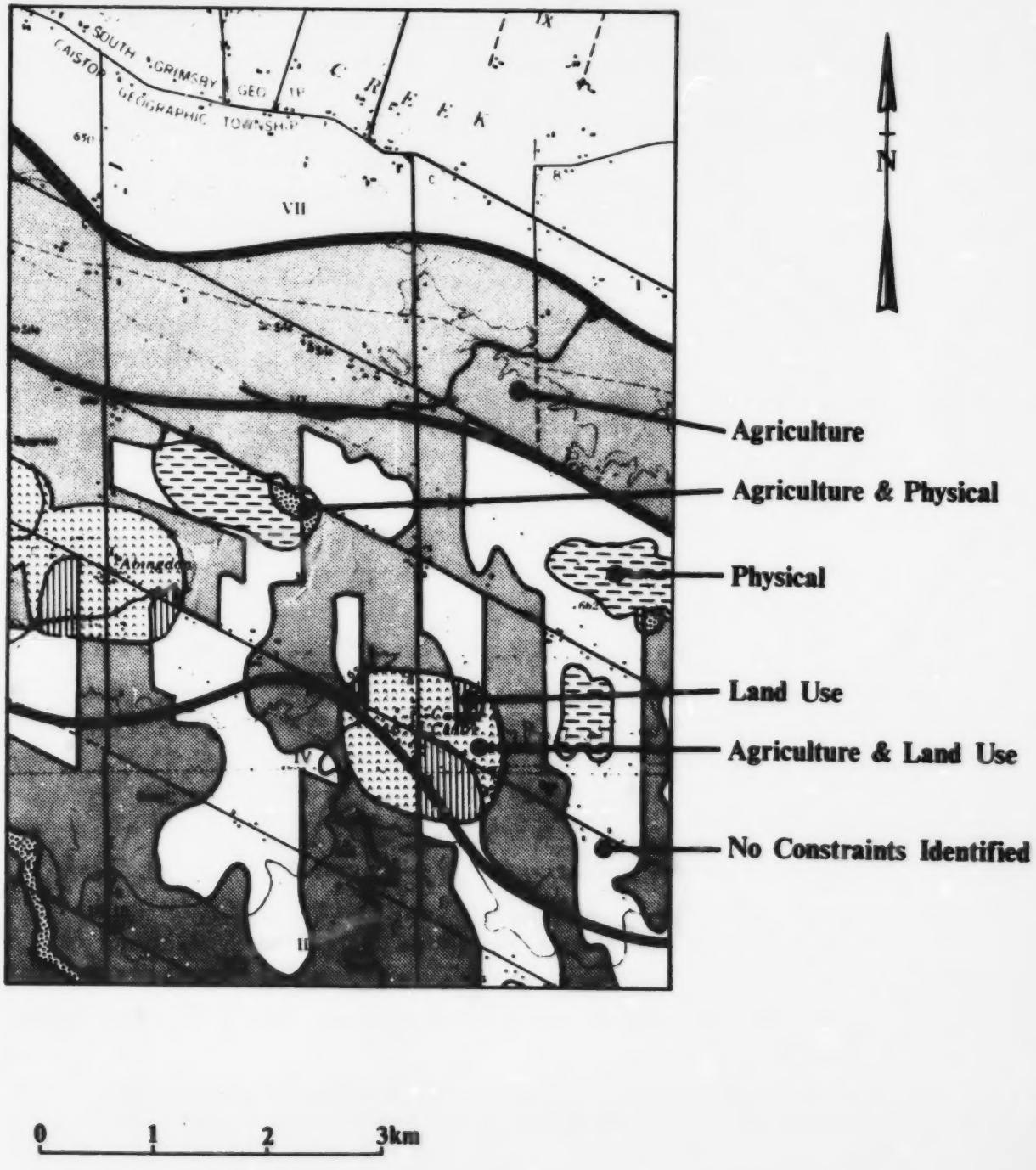
The process was iterative in nature. Tentative conclusions were reached by the site selection team regarding the treatment of factors, excluding the consideration of the maintenance of choice principle. Preliminary composite constraint maps were then prepared. The results were reviewed in terms of whether there appeared to be an adequate diversity of siting choices for major tradeoffs and factors not considered in site area identification. If the site selection team concluded that the subsequent stages of site selection would be seriously restricted (from a maintenance of choice perspective), the treatment of factors was modified to broaden the range of siting opportunities.

The factor application process took place in two parallel streams: one for landfill/fully integrated sites and one for physical/chemical treatment plant/incinerator sites. Figure 7.8 provides an example of a small portion of a composite constraint map. The major distinguishing features which necessitated separate constraint mapping processes were:

- the standard landfill or the fully integrated facility placed a higher priority on consistent silt-clay soil depth (greater than 10 m, with areas with 20 m or more having priority over areas with less depth) than an incinerator physical/chemical treatment facility (approximately 10+ m);

- an integrated or landfill only site has a greater minimum site size requirement (112 ha - 227 acs) compared with that for an incinerator-physical/chemical treatment plant site (80 ha - 198 acs).

Figure 7.8
Constraint Map - Example,Site Area Identification
Source: M.M. Dillon (D5) Volume 1



e) Site Areas

This process identified 152 potential site areas: 65 landfill/integrated site areas (LF) and 87 physical/chemical treatment and/or incinerator site areas (PI)[1]. Figures 7.9 and 7.10 illustrate these areas.

2. Potential Site Identification Process

Once the constraint mapping had identified these 152 potential site areas, they were progressively reduced in number and size until a relatively small number remained.

This was done in a series of four screens. The initial suitability screen was conducted at a scale of 1:50 000, using secondary source data interpreted site area by site area. The remaining three screens - the suitability screen, the compatibility screen and the systems screen - were conducted at a scale of 1:10 000. With each screen, site areas were reviewed based on the analysis and interpretation of the data obtained. Site areas not rejected during one screen were retained for further consideration in the next. This process is depicted in Figure 7.11.

---

[1] The site classification system used throughout this chapter and the supporting documentation is described in the following example:

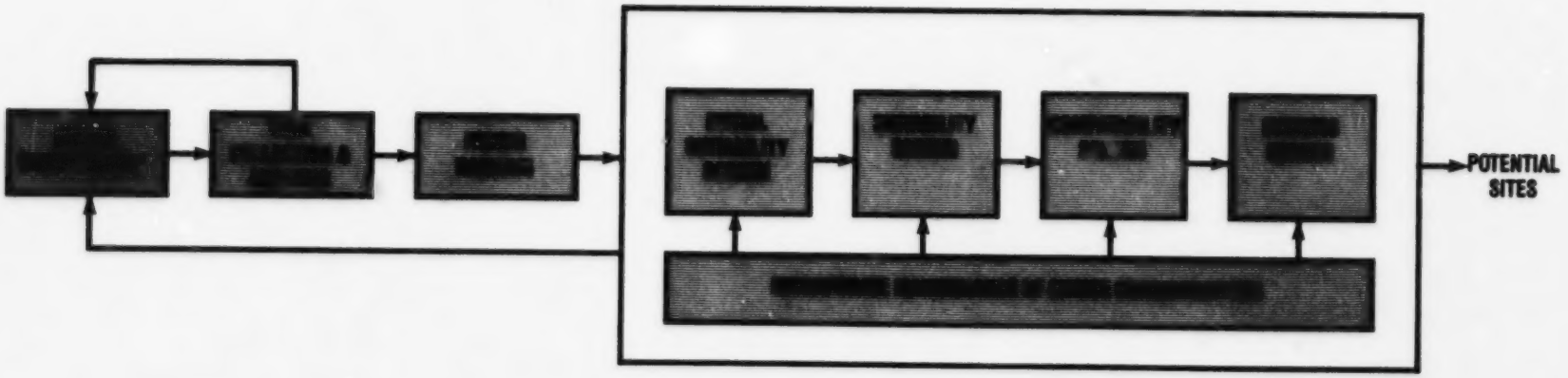
LF-2N, PI-2W

- LF refers to a site which may be considered suitable for a fully integrated facility, a landfill, or a landfill together with a physical/chemical treatment plant or incinerator.
- PI refers to a site for a physical/chemical treatment plant, or an incinerator or a combined physical/chemical treatment plant and incinerator.
- 2 is a number assigned to the site when it was identified earlier in the process.
- N or W refers to the site's geographic location (N=north, W=west, C=central, E=east) in relation to the western end of Lake Ontario.

Figure 7.9
Site Areas - Physical / Chemical Treatment Plants and Incinerators
Source: OWMC, Phase 3 Report, 1984

Figure 7.10
Site Areas - Engineered Landfill or Integrated Facility
Source: OWMC, Phase 3 Report,1984

Figure 7.11
Potential Site Identification Process
Source: M.M. Dillon (D5) Volume 2



Considerations influencing the rejection or retention of a site included site specific constraints, agency and public concerns, and the need to maintain choice.

Even when doubts arose about the suitability of a particular site area, it was retained for further consideration. The end result was a short list of potential sites suitable for more detailed analysis at the next stage, the initial comparative evaluation.

a) Factor Identification

First, the site selection consultants made a preliminary identification of factors, taking into account the site selection goals and objectives, the facilities characteristics assumptions, the site selection principles, and the results of the data collection and interpretation.

The preliminary list of factors was refined and modified throughout the course of data collection and analysis and through the various stages in factor application.

Different factors were employed in each successive screen. The factors employed during the initial suitability screen were a combination of the exclusionary factors from the site area identification with other factors considered but not employed at that stage (non-exclusionary factors). The factors used for the remaining screens were a combination of the exclusionary factors from the site area identification, non-exclusionary factors considered but not used at that time, and new factors which could be used in the relative ratings of site areas and in the allowance for maintenance of choice.

The factors used to identify potential sites are listed in Dillon (D5) Volume 2, Table 6.1, pp.18-21. This Table also shows at which screen they were applied.

b) Data Collection and Analysis

Data collection and analysis was undertaken to provide an information base from which the size and number of site areas could be sufficiently reduced to permit a systematic comparative evaluation. It involved using collected data not previously employed, refining data used before, and adding further data specific to each site area. This was done at two scales of analysis: 1:50 000 and 1:10 000. The 1:50 000 scale was used in the initial screen of the 152 site areas. The 1:10 000 scale was used for further screening of the 90 site areas which emerged from the first screen.

The process included a detailed review and refinement of previously collected data, supplementary agency contacts, roadside field investigations of potential site areas, air photo interpretation, and the analysis and mapping of data on to both the absolute and the relative suitability of particular site areas.

c) Factor Ranking

As before during the stage of identifying site areas, it was recognized that the factors were not all of equal importance and had to be ranked. Again, the bases for ranking were the site selection goals and principles, and agency and public concerns were also considered.

As in the previous stage, the consultants initially ranked factors for their respective disciplines, and these individual rankings were then combined into an overall multidisciplinary ranking.

Once again, four levels were established ranging from 1 (low constraint) to 4 (high constraint):

Level 1 - Factors representing positive or very minor siting constraints.

Level 2 - Factors representing minor constraints.

Level 3 - Factors representing moderate constraints.

Level 4 - Factors representing major risks or impacts.

The overall ranking and its rationale is provided in Dillon (D5) Volume 2, Appendix E, Tables E5.2 - E5.5.

d) Factor Application

As explained, the application process took place in a series of four screens: the initial suitability screen, the suitability screen, the compatibility screen, and the systems screen.

The initial suitability screen emphasized excluding site areas on the basis of various combinations of Level-4 factors using data from secondary sources which were available on a scale of 1:50 000 and could be interpreted confidently enough to exclude site areas in whole or in part. The reasons for exclusion were site size and configuration, transportation and utilities, Significant Environmental Units (SEUs), confirmation of exclusionary factors, and combinations of these. A listing and rationale for the exclusion of site areas at this stage is provided in Dillon (D5) Volume 2, pp.40-46.

The suitability screen also used Level-4 factors. The first step (major impacts) excluded site areas in whole or in part based on constraints severe enough to warrant rejection without reference to the other ratings. In the second step (relative suitability), a site area was only excluded on the basis of one or more Level-4 ratings if there was a high level of confidence in the data and it had no important offsetting benefits, or if other site areas offered the same benefits together with less severe constraints. A listing and rationale for the exclusion of site areas in the suitability screen is provided in Dillon (D5) Volume 2, Table 9.1, pp.50-52.

The screening process to this point had reduced the number of potential landfill/integrated site areas to 10. The constraints associated with these remaining sites were not considered sufficient to warrant rejection based on the level of information available. It was concluded, however, that the compatibility screen provided further potential for reducing the number of remaining PI site areas. PIs were grouped with respect to their geographic proximity to landfills (LF). The major consideration used in the compatibility screen was land use compatibility as represented by designations in official plans. A listing and rationale for the exclusion of site areas in the compatibility screen is provided in Dillon (D5) Volume 2, pp.61-67.

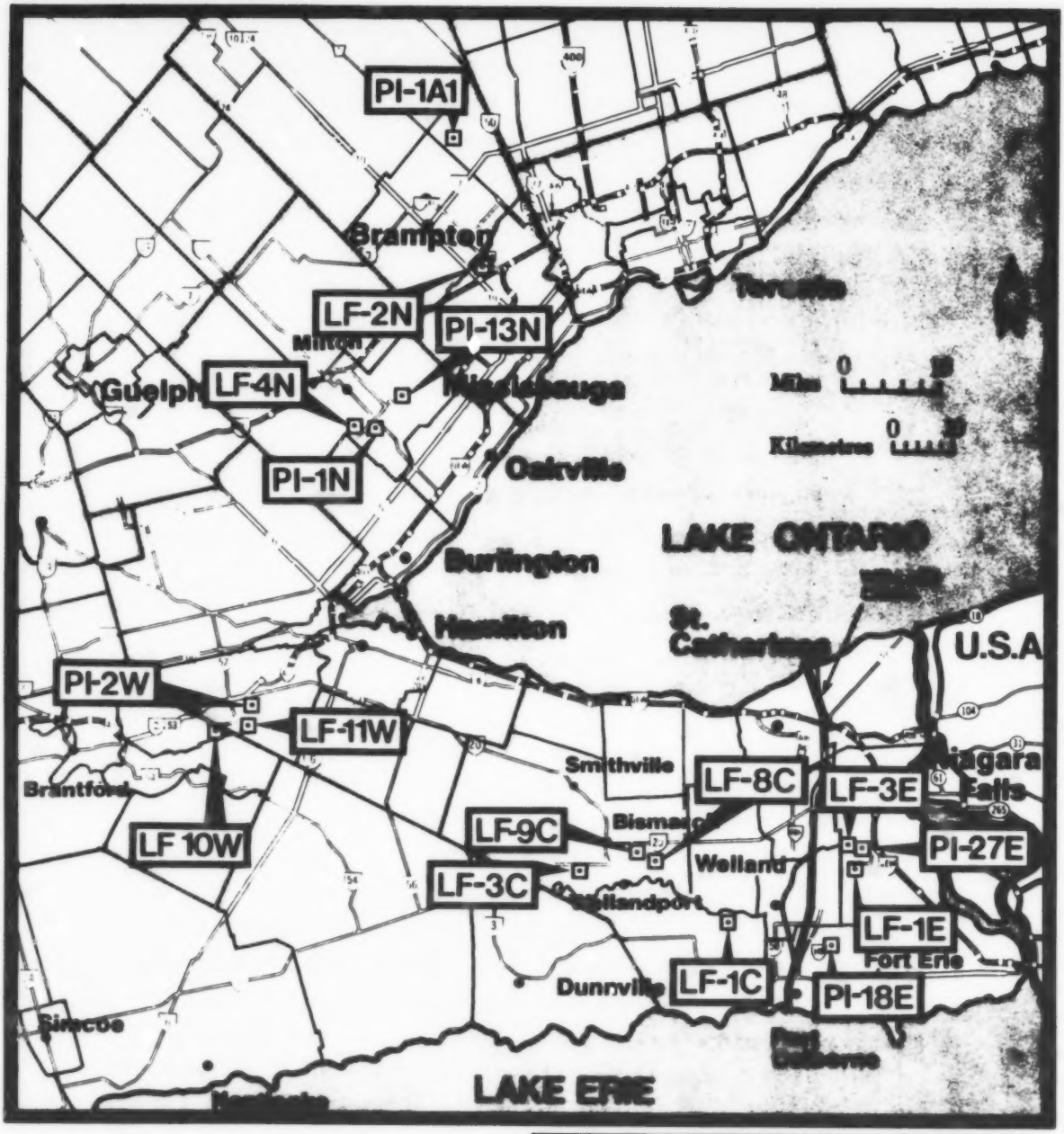
In the system screen the major considerations were the proximity of PI to LF site areas and the general nature of uses along the access roads linking them (Dillon (D5) Volume 2, p.67).

e) Potential Sites

The process outlined above reduced the number of potential sites from 152 to 16. Five of these (LF-10W, LF-11W, LF-4N, LF-1E, LF-3E) were considered potentially suitable for either landfills or fully integrated facilities, but it was recognized that LF-4N might not be suitable for an incinerator because of its proximity to the Niagara Escarpment. Two sites were considered suitable only for a landfill or a landfill in association with a physical/chemical treatment plant (LF-1C and LF-2N). Three were considered suitable only for fully integrated facilities (LF-3C, LF-8C, LF-9C). Six (PI-1A1, PI-1N, PI-13N, PI-2W, PI-18E, PI-27E) were considered suitable for an incinerator or an incinerator alone in conjunction with a physical/chemical treatment plant.

The reasons for retaining the sixteen potential sites for further consideration are summarized in Dillon (D5) Volume 2, Appendix E, Table E5.8. The locations of these sites are shown in Figure 7.12.

Figure 7.12
Potential Sites
Source: OWMC, Phase 3 Report,1984



- Potential Site
- Regional Municipal & County Boundaries
- Township, Town & City Boundaries
- LF Landfill
- PI Physical/Chemical Treatment Plant & Incineration

Site Name	Landfill	Physical/ Chemical	Incinerator	
LF-2N	•	•		
LF-4N	•	•	•	Integrated
LF-10W	•	•	•	Integrated
LF-11W	•	•	•	Integrated
LF-1C	•			
LF-3C	•	•	•	Integrated
LF-8C	•	•	•	Integrated
LF-9C	•	•	•	Integrated
LF-1E	•	•	•	Integrated
LF-3E	•	•	•	Integrated
PI-1A1		•	•	
PI-1N		•	•	
PI-13N		•	•	
PI-2W		•	•	
PI-18E		•	•	
PI-27E		•	•	

3. Candidate Site Identification Process

The process of identifying candidate sites began after the potential site identification process had reduced the number of potential site areas to 16; 10 landfill sites and six physical/chemical treatment/ incinerator plant sites. These 16 sites were combined into eight integrated and 10 partially integrated siting options[1]. The process used to identify candidate sites is depicted in Figure 7.13.

The product of the candidate site identification process was a number of candidate sites suitable for more detailed analysis during the next step in the site selection process; detailed comparative evaluation.

a) Factor Identification

Once again, consultants carried out the identification of preliminary factors. Each factor was divided into indicators[2]. Where appropriate, distinctions were made between factors and indicators pertaining to the site, the site vicinity[3], and access roads. Among the considerations in the identification were the site selection goals, objectives, and principles; the facilities characteristics assumptions; and the results of data collection and interpretation. The factors used in the initial comparative evaluation are listed, defined, and assessed in Dillon (D5) Volume 3, Table G5, Appendix G.

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[1] A siting option consists of a site (fully integrated) or sites (partially integrated) together with the local and regional access routes to (and between) the sites. The partially integrated siting option LF-4N/PI-13N, for example, is shown in Figure 7.14.

[2] Indicators are ways of precisely identifying, describing and predicting risks, impacts and engineering cost concerns.

[3] The site vicinity is defined as an area extending 1000 m outward from the potential emissions area of each potential PI site or PI component of an integrated facility and 500 m outward from each landfill.

Figure 7.13
Candidate Site Identification Process
Source: M.M. Dillon (D5) Volume 3

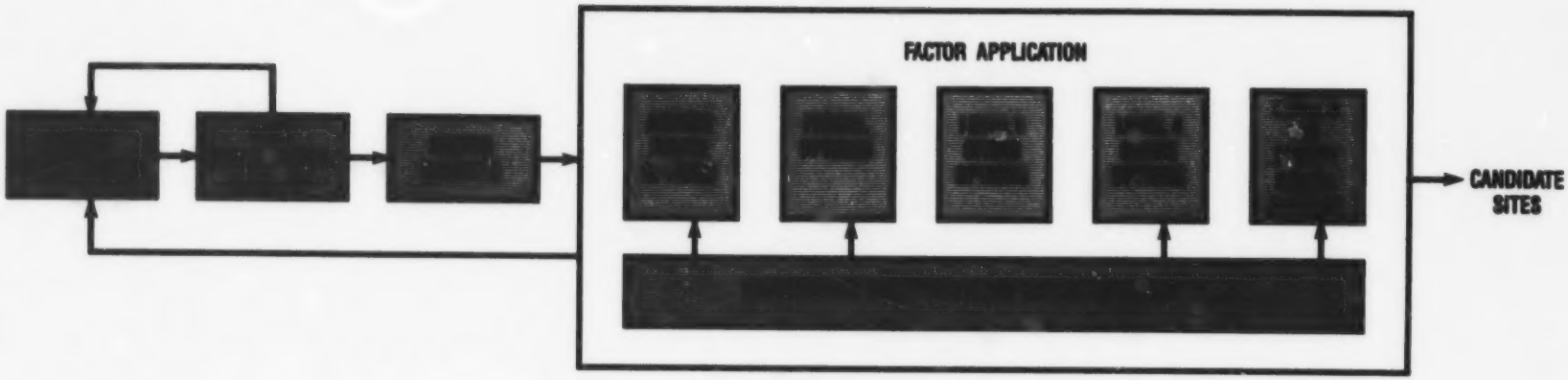
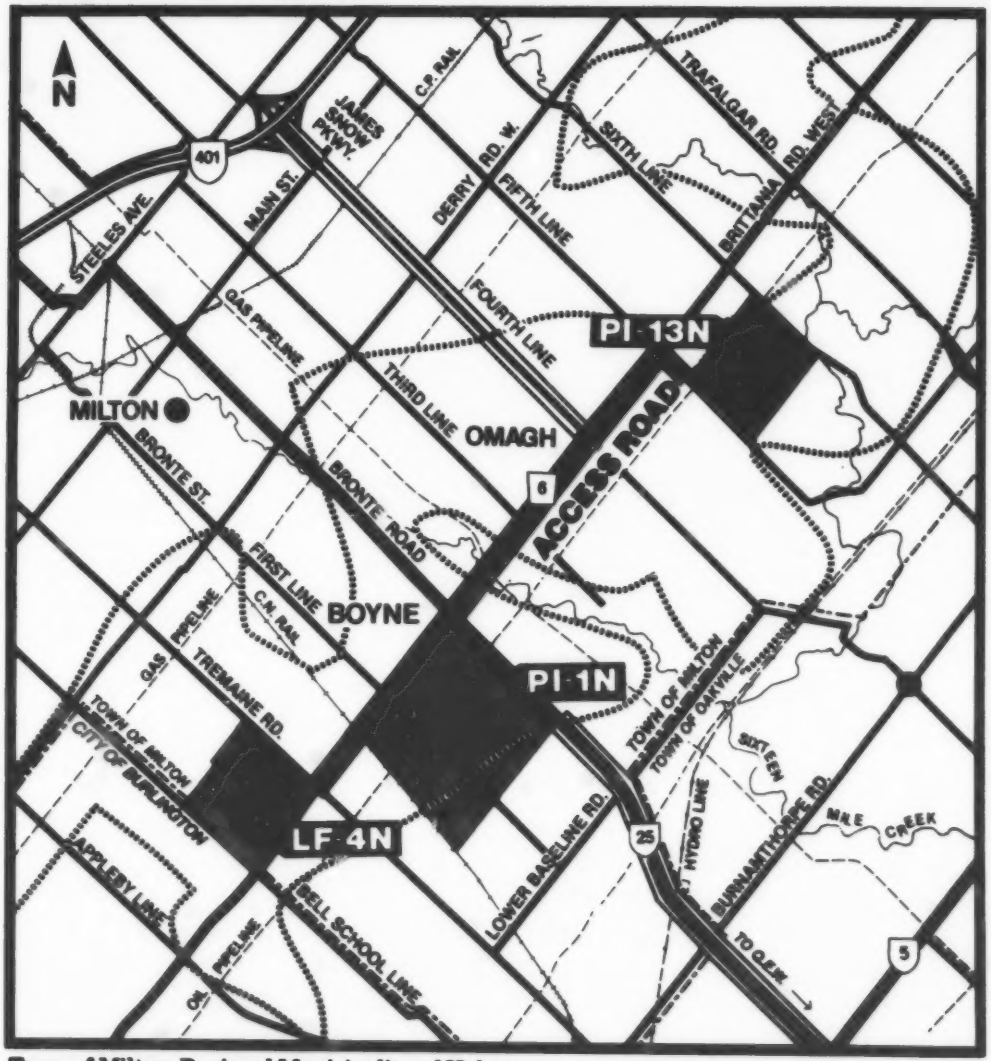


Figure 7.14
Example of Partially Integrated Siting Option LF-4N / PI-13N
Source: OWMC, Phase 3 Report,1984



Town of Milton, Regional Municipality of Halton

b) Data Collection and Analysis

The data collection and analysis were undertaken to provide an adequate information base for selecting a small number of sites from among the 16 which could then be subjected to a more detailed comparative evaluation.

The process involved refinements to existing data, and the collection of additional site, site vicinity, and access road data. This involved reviewing secondary source data, contacting agencies, interpreting air photos and topographic maps, and making roadside field investigations.

The data collected were analysed and synthesized in various ways, including:

- o the use of models for the transportation and air dispersion analyses;
- o the preparation of individual and composite maps; and,
- o the incorporation of site, site vicinity, and access road indicators into composite matrices to analyse the siting options.

c) Factor Ranking

As in the previous stages of the process, it was recognized that all factors were not of equal importance and that it would be desirable to rank them. Again, the factors were first ranked within disciplines by the consultants responsible, and these individual rankings were then combined into an overall multidisciplinary ranking.

The factors were ranked with respect to the relative severity of risks, impacts, and costs. Risk factors tended to be ranked higher than impact factors and impact factors tended to be ranked higher than cost factors.

In the ranking process, risk was considered in terms of:

- o the likelihood of events (such as transportation accidents),
- o the provision of a second level of protection,
- o the potential for exposure of people, crops, and livestock would receive in the event of an accidental release.

Impacts were considered in terms of a wide range of physical, natural environmental, resources, land use, social, and transportation impacts. Five levels of rankings emerged, ranging from 1 (low constraint) to 5 (high constraint):

Level 1 - Factors representing positive or very minor siting constraints.

Level 2 - Factors representing relatively minor constraints.

Level 3 - Factors representing moderate constraints.

Level 4 - Factors representing major adverse impacts or risks.

Level 5 - Factors representing severe risks.

The overall ranking and the rationale is set out in Dillon (D5) Volume 3, Tables 14.1-14.5, pp.27-35.

d) Factor Application

The comparative evaluation of siting options took place in a series of steps. A comparative analysis of access route and parcel options was undertaken first in order to define each siting option. The initial comparative evaluation of siting options followed the access route and parcel options analysis.

i) Access Routes

Before it was possible to compare siting options, it was necessary to define the major components of each option. This required a preliminary identification of the preferred access route(s) from the 400-series highways to and between the site(s). The comparison of access route options is reviewed in Dillon (D5) pp.36-98. The preferred access routes to be used in the initial comparative evaluation of the siting options are shown on Dillon (D5) Volume 4 - Map Portfolio - Map 13.

ii) Parcel Options

In considering potential sites, it was recognized that it would be desirable if the potential sites were all of approximately the same size. In this way, the potential impacts associated with the larger sites would not be overstated. The three largest potential sites - LF-10W, LF-1E, and PI-1N - contained two parcels each, either of which was adequate for facility siting. After considering the parcel options for each of the three sites, it was decided that no one parcel option should be selected over the other. In the case of LF-10W and PI-11N, it was decided that the differences between the two parcels appeared to be too limited to indicate a clear preference. In the case of LF-1E, it was concluded that there was insufficient information available at this stage regarding the relative differences between the parcels to select one parcel over the other.

iii) Initial Comparative Evaluation

The initial comparative evaluation began with eight integrated and ten partially integrated siting options:

Integrated Siting Options	Partially Integrated Siting Options
LF-4N	LF-2N/PI-1A1
LF-10W	LF-2N/PI-1N
LF-11W	LF-4N/PI-1N
LF-3C	LF-1C/PI-18E
LF-8C	LF-10W/PI-2W
LF-9C	LF-11W/PI-2W
LF-1E	LF-1E/PI-27E
LF-3E	LF-4N/PI-13N
	LF-2N/PI-13N
	LF-3E/PI-27E [1]

The first step was to prepare a series of composite constraint maps; (Dillon (D5) Volume 4, Maps 14 to 31). The consultants also prepared a series of detailed composite matrices specifying the differences between the siting options for over 100 indicators. These matrices were structured in terms of site, site vicinity, and access road factors and indicators; (Dillon (D5) Volume 3, Appendix K, Tables K.1 to K.3).

The process used to compare siting options was undertaken in a series of steps. Siting options rated as Level 5 (severe risk) were reviewed first. The concerns which led to the rating(s) were reviewed to determine if they were sufficient by themselves to warrant the rejection of a siting option. If there was doubt regarding the potential acceptability of a siting option, consideration was given to such matters as the other (especially risk related) ratings for the siting options, the diversity of siting choices remaining, the level of confidence associated with the rating, and the potential for overcoming or significantly reducing the potential risk or impact.

Siting options rated as Level 4 (major adverse risk or impact) were then reviewed. Again, particular consideration was

[1] LF-3E/PI-27E was rejected early during the initial comparative evaluation stage (as a result of the exclusion of LF-3E) and no data were recorded in the composite matrices.

given to risk related concerns. No siting options were eliminated exclusively on the basis of a Level 4 ranking. In all cases, consideration was given to all the other ratings, the diversity of siting choices remaining, the level of confidence associated with the data employed for rating purposes and the potential for mitigation.

Siting options receiving ratings more favourable than Level 4 were then considered. Particular attention was devoted to siting options having a number of relatively favourable ratings e.g. Level 1 or Level 2, to determine if it was possible to move directly to the selection of a preferred siting option.

Level 5 Siting Options

Each of the siting options that had received a Level 5 overall rating is discussed in Dillon (D5) Volume 3, pp.112-122. The reasons for their rejection are outlined briefly below.

- LF-3E

  LF-3E was found to be hydrogeologically unsuitable and was therefore rejected. This also involved rejecting the partially integrated siting option LF-3E/PI-27E.

- LF-4N

  The consultants identified LF-4N as the most constrained site for air dispersion and air quality. Since air dispersion constitutes a major pathway into the environment for a PI facility, keeping LF-4N as an integrated siting option such as this would not meet the goal of minimizing risk to human health. LF-4N as an integrated site offered no adequate offsetting advantages and therefore was rejected.

- LF-8C
  LF-8C was found to be the most constrained siting option for sensitive crops and livestock and was dropped because other sites remained that were equally or more promising in all other respects.

- LF-10W/PI-2W and LF-11W/PI-2W
  PI-2W was rejected because of air transport safety constraints, poor hydrogeology and archaeological resources. This also meant dropping both LF-10W/PI-2W and LF-11W/PI-2W.

- LF-2N/PI-1A1
  Since airborne emissions represent a primary pathway into the environment, the high population levels surrounding site PI-1A1 were considered a significant constraint. OWMC concluded that the risks associated with this were such that this site should not be retained for further consideration.

Level 4 Siting Options

Each of the following siting options received one or more Level 4 overall ratings. They are treated at greater length in Dillon (D5) Volume 3, pp.122-148.

- LF-10W
  Site LF-10W was identified as having two main constraints, hydrogeology and biology. Because it had no significant advantages to offset these, it was dropped from further consideration.

- LF-11W
  Site LF-11W was subject to many of the same constraints as LF-10W, and also contained an important archaeological and historic site. Because it had no significant advantages to offset these considerations, it was dropped from further consideration.

- LF-1C/PI-18E

  LF-1C was the only potential site to receive a Level 4 rating for surface drainage constraints. For transportation, it had the highest risk of any partially integrated option retained. OWMC judged that its advantages could not offset these constraints, and therefore dropped it from further consideration.

- LF-1E

  Site LF-1E was identified as having two Level 4 constraints - biology and transportation. LF-1E, however, was also recognized as having a number of advantages, including a favourable hydrogeologic rating, lower potential on-site, site vicinity, and access road, agricultural and socio-economic impacts than the other two integrated sites which were retained, and comparable or better socio-economic and agricultural ratings as compared to all the remaining siting options. LF-1E was also only one of three integrated siting options which remained. It was concluded that these important advantages favoured the retention of LF-1E for further consideration.

- LF-3C and LF-9C

  LF-3C and LF-9C both received Level 4 ratings in terms of potential agricultural, socio-economic impacts and transportation and utilities constraints. In addition, LF-3C received a Level 4 rating for sensitive agricultural receptors. These constraint ratings largely resulted from the location of the sites in stable and productive agricultural areas somewhat removed from the 400-series highway.

  Both LF-3C and LF-9C, however, were considered by OWMC to possess significant offsetting benefits which warranted their continued consideration. Both sites are located over deep and consistent silt-clay soils. As such, these sites would minimize the potential for the ground water migration of contaminants.

The retention of sites with very favourable hydrogeologic conditions was considered by OWMC as essential to maintaining the opportunity for the establishment of facility components in settings which kept to a minimum the potential for off-site migration of contaminants.

The retention of both LF-3C and LF-9C was considered necessary for a number of additional reasons which are outlined in Dillon (D5) Volume 3, pp.132-135.

- LF-2N/PI-1N

Two Level 4 constraints were identified with the LF-2N/PI-1N siting option: hydrogeology and land use. With respect to hydrogeology, LF-2N was rated at Level 4. It was concluded that the rejection of LF-2N, based on potential hydrogeologic constraints, would be premature. The land use constraints associated with both LF-2N and PI-1N were also considered insufficient to warrant site rejection. In addition to the conclusion that the constraints associated with LF-2N/PI-1N were insufficient to warrant site rejection, OWMC also concluded that there were many advantages associated with LF-2N/PI-1N which favoured the retention of the siting option. These are discussed in Dillon (D5), Volume 3, pp.137-8.

- LF-1E/PI-27E

As noted above, LF-1E offered several advantages to offset its low ratings for biology and transportation. PI-27E had three main constraints: biology, air dispersion and air quality, and transportation. Nevertheless, advantages such as good hydrogeology and surface drainage, a low constraint rating for sensitive agriculture, an industrial designation and location in an industrial area, direct access to the Queen Elizabeth Way, and a low accident probability made it desirable to retain it, and therefore siting option LF-1E/PI-27E, was retained for further consideration.

- o LF-2N/PI-13N

  The decision to retain LF-2N is noted above.

  For PI-13N, two major Level 4 constraints appeared: biology and land use. However, this site also had many advantages, which are discussed in Dillon (D5) Volume 3, pp.146-7, and these warranted its retention.

- o LF-4N/PI-13N

  As previously indicated, LF-4N (as a landfill or a landfill together with a physical/chemical treatment plant) was not considered to have any constraints which warranted rejection. LF-4N also was considered to have relative advantages which merited its further consideration. OWMC decided to retain the siting option because the same held true for PI-13N.

Level 3 or Lower Siting Options

The purpose of this review was to decide whether the one siting option which appeared not to have any major constraints could be selected as the preferred siting option without further more detailed consideration.

- o LF-4N/PI-1N

  While this was the only siting option not to receive any Level 4 constraint ratings, constraints did appear during the review that seemed to warrant further consideration. These are treated at greater length in Dillon (D5), Volume 3, pp.148-9.

e) Candidate Sites

The following siting options with Level 5 ratings were dropped from further consideration: LF-3E, LF-4N (integrated), LF-8C, LF-10W/PI-2W, LF-11W/PI-2W and LF-2N/PI-1A1. The following siting options with Level-4 ratings were dropped from further consideration: LF-10W, LF-11W, LF-1C/PI-18E.

The initial comparative evaluation identified eight candidate sites, which are illustrated in Figure 7.15. The chief reasons for retaining each candidate site are summarized in Dillon (D5) Volume 3, Table 16.4, pp.152-153.

Three sites (LF-1E in Niagara Falls and LF-9C and LF-3C in West Lincoln) were identified as fully integrated siting options because they could accommodate all three facility components. Each of the other five sites was considered in conjunction with one other as a partially integrated option. The partially integrated siting identified options were: LF-2N/PI-13N, LF-2N/PI-1N, LF-4N/PI-1N, LF-1E/PI-27E and LF-4N/PI-13N.

E. SELECTION OF THE PREFERRED SITE

The fourth step in the site selection process was the selection of the preferred site. The process of selecting the preferred site involved five main steps:

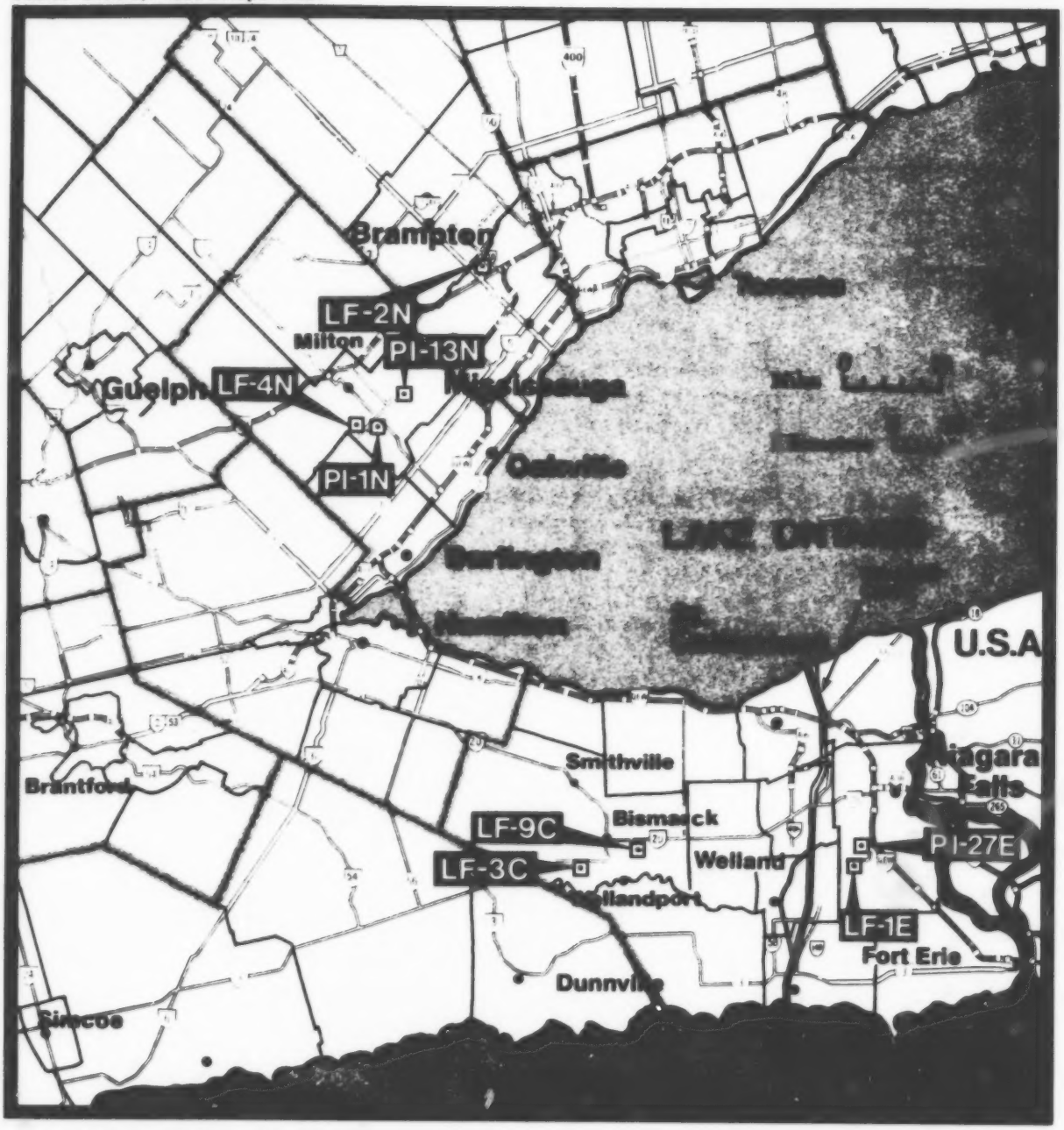
1) Data Collection and Factor Identification
2) Refinement of Siting Options
3) Comparison of Siting Options
   - o Basic Acceptability Analysis
   - o Detailed Comparative Evaluation
4) Selection of Preferred Site
5) Confirmation of Comparative Evaluation.

1. Step 1: Data Collection and Factor Identification

a) Data Collection

The process began with compiling data obtained from field investigations and on-site testing; interviews with area residents, businesses, and municipalities; review of data from secondary sources (such as accident statistics and water well records); and meetings with provincial ministries and agencies.

Figure 7.15
Candidate Sites
Source: OWMC, Phase 3 Report,1984



- Candidate Site
- Regional Municipal & County Boundaries
- Township, Town & City Boundaries
- LF Landfill
- PI Physical/Chemical Treatment Plant & Incineration

Site Name	Landfill	Physical/ Chemical	Incinerator	
LF-2N	•	•		
LF-4N	•	•		
PI-1N		•	•	
PI-13N		•	•	
LF-3C	•	•	•	Integrated
LF-9C	•	•	•	Integrated
LF-1E	•	•	•	Integrated
PI-27E		•	•	

These data were compiled into a series of detailed matrices, or (for the site and site vicinity[1] study areas) a series of data maps. Summary matrices and maps are included in Dillon (D6) Volume 2.

b) Factor Identification

The site selection consultants established the factors used to evaluate the differences and similarities in potential risks, impacts and costs associated with the establishment of a special waste management facility. Further basis for the evaluation of risk is provided in Generic Risk Assessment by Environ Corporation (D7).

Factor identification and refinement took place in a series of steps as outlined in Dillon (D6) Volume 2, Figure 4.2, p.97. The initial factor list was presented to the public in the OWMC document entitled "Phase 4A Factors" (OWMC, 1985a). Refinement of factors took place as a result of public and agency review and input, and as a result of technical review and modification.[2]

The factors were structured into four levels:

- o study goals;
- o factor grouping;

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[1] Site vicinity in Phase 4A refers to the study area used around each of the candidate sites. This area extends approximately 2 km from the centre of each candidate site.

[2] Tables B.5 and B.6 in Appendix B of Dillon (D6) Volume 2 contain a list of all changes made to factors during Phase 4A and an explanation for each change including responses to public concerns. Table C.8 lists the public and agency issues addressed by each factor in site selection. Table C.7 lists the response to each issue raised in terms of factor application.

- o factors; and
- o indicators.

The three study goals are risks, impacts and engineering cost. The 13 factor groupings reflect the major areas of concern addressed in Phase 4A within each of the goals. Factors represent the major elements or dimensions within the factor groupings. Factors are subdivided into indicators which are ways of identifying, describing and predicting risks, impacts and costs.

Factors used for each set of options in the refinement of siting options are identified in Dillon (D6) Volume 1, Chapters 4 through 7. Dillon (D6) Volume 2, Chapter 4 provides a detailed documentation of factor identification, refinement and ranking for siting option comparison.

2. **Step 2: Refinement of Siting Options**

Before undertaking a detailed comparative evaluation, the site selection team had to make a series of preliminary decisions about four aspects of the candidate sites and the interrelationships between facility components, namely:

- o the refinement of site boundaries (LF-3C, PI-1N and LF-1E);
- o the choice of a preferred access route to each of the sites and, for the partially integrated options, of routes between the components;
- o the identification of a preferred rail access route option to the incinerator and the physical/chemical treatment plant for transporting additives and reagents;
- o the relative benefits of locating the physical/chemical treatment plant with the incinerator or with the landfill for partially integrated options.

a) Refinement of Site Boundaries

Before undertaking the detailed comparative evaluation, the site selection team refined site boundaries to minimize on-site impacts and to ensure that the sites were roughly the same size and therefore comparable. They did so for the three largest candidate sites LF-3C, PI-1N and LF-1E (Dillon (D6) Volume 1, Chapter 4).

b) Access Road Options

Before comparing the options, the consultants had to designate preferred access routes from the 400-series highways to each option and transfer routes between PI and LF sites. The study of access roads compared the local and regional choices remaining at the end of Phase 3B, as well as the local and regional routes identified in Phase 4A.

The process is described in Dillon (D6) Volume 1, Chapter 5. The preferred access route for each siting option and the stage at which each was chosen is listed in Dillon (D6) Volume 1, Table 5.28, pp.176-9.

c) Rail Access Options

The analysis of rail access options to each site assumed that rail service was not an absolute requirement for facility operations. Rail service was treated as an opportunity to be realized only where it offered significant advantages (such as reduced truck volumes) without offsetting major impacts and costs. The analysis also assumed that the only economical use of rail service in the foreseeable future would be for transporting additives and reagents, such as cement, for the solidification process.

The study identified preferred rail access options for six of the candidate sites: LF-4N, PI-1N, LF-3C, LF-9C, LF-1E, and PI-27E. OWMC concluded that rail service did not represent an

opportunity at candidate sites PI-13N and LF-2N. Providing rail service to these sites involved major impacts and costs.

This process is described in Dillon (D6) Volume 1, Chapter 6.

d) Location of the Physical/Chemical Treatment Plant for Partially Integrated Siting Options

The siting options fall into three configurations. A fully integrated facility involves a landfill, a physical/chemical treatment plant, including the solidification plant, and an incinerator all on one site. A partially integrated facility has two sites and involves a choice between locating the physical/chemical treatment plant with the landfill or with the incinerator. The next step therefore, was to determine the preferred location for the physical/chemical treatment plant - with the incinerator or with the landfill. The siting options considered at this stage were LF-1E/PI-27E, LF-4N/PI-13N, and LF-4N/PI-1N. For each combination it appeared best to place the physical/chemical treatment plant with the incinerator. The process is described in Dillon (D6) Volume 1, Chapter 7.

3. Step 3: Comparison of Siting Options

The comparison of siting options was divided into two streams - basic acceptability and detailed comparative evaluation.

a) Basic Acceptability Analysis

Basic Acceptability analysis was intended to reveal whether any major new constraints had appeared during the Phase 4A analysis that would rule out one or more sites. The analysis began with a review of criteria which could potentially exclude a site.

Only hydrogeologic natural containment, however, was considered sufficiently severe to potentially warrant site rejection.

The analysis identified four sites - LF-2N, LF-4N, PI-13N and PI-1N - that might not provide natural containment.

i) LF-2N

The hydrogeologic analysis of LF-2N revealed that the proposed excavation for the landfill (to a depth of 10 m) would directly cut into the aquifer. In effect, this meant that the site would not provide a second level of protection, since leachate from the landfill could be expected to discharge directly into the underlying aquifer without the attenuation that a confining layer would afford.

The consultants tried to offset this by redesigning the landfill to limit the excavation depth to 5 m. This, however, did not enhance the natural containment potential; because of natural fracturing, the upper 5 m of the confining layer of the site could only be expected to provide minimal containment. The site was therefore rejected.

ii) PI-13N

On applying the basic acceptability screen to PI-13N (assuming an excavation depth of 8 m for the incinerator and the physical/chemical treatment plant), the consultants found that the excavation would directly intersect the aquifer in places and therefore the site would not provide natural containment. Reducing the excavation depth from 8 to 5 m did not solve this problem, and PI-13N was therefore judged basically unacceptable. But since the consultants did not reach this conclusion until they had all but finished the detailed comparative evaluation, the combination PI-13N and LF-4N was included in the detailed comparative evaluation analysis.

iii) LF-4N

The hydrogeologic analysis of LF-4N indicated that an excavation 10 m deep would penetrate most of the confining layer and this led to serious doubts about whether the natural containment was adequate. Since the potential for containment was based on a preliminary drilling program, there was concern that the full drilling program would show the natural containment to be negligible over portions of the site. Design modifications were then considered as a way to enhance the natural containment potential. It appeared that either reducing the excavation depth for the landfill cells from 10 m to 5 m, or limiting development to parts of the site where the confining layer was more than 15 m deep, would improve the natural containment potential. On the positive side, it was noted that the confining layer is uniform and laterally and vertically continuous on both sites. It was also, however, acknowledged that the confining layer is thin: consequently, any contaminants released at the site could be expected to move through it fairly rapidly.

While LF-4N might be characterized as having marginal potential for natural containment, it was still basically acceptable, and the consultants believed its hydrogeologic limitations might be more than outweighed by its other advantages for risk, impact, and cost. Therefore, the site was retained for further consideration.

iv) PI-1N

Again, on applying the basic acceptability screen to PI-1N (assuming an excavation depth of 8 m), the consultants found that the excavation would directly intersect the aquifer in places. Here, however, reducing the excavation depth to 5 m meant that the confining layer would not be completely penetrated, and so the site did provide some natural containment. Accordingly, PI-1N was judged basically

acceptable, although on hydrogeologic grounds it could be characterized as marginal.

v) Other Sites

All the remaining landfills (LF-3C, LF-9C, LF-1E) and the remaining PI site (PI-27E) were considered basically acceptable and were therefore retained for consideration in the detailed comparative evaluation analysis.

b) Detailed Comparative Evaluation

The detailed comparative evaluation chiefly involved the consideration of major issues and tradeoffs between pairs of siting options, taking into account the factor rankings. The following siting options were examined: LF-4N/PI-1N and LF-4N/PI-13N in Milton, LF-3C and LF-9C in West Lincoln, and LF-1E and LF-1E/PI-27E in Niagara Falls.

These were compared using a summary analysis of each site selection consultant's conclusions for his own discipline, together with background data embodied in tables and working maps. The concerns and preferences expressed during the public consultation program also contributed to the ranking of factors and the identification of issues and tradeoffs.

In the course of the review, it became apparent that the differences between siting options within the same geographic area were generally less pronounced than those between options in different areas. The consultants therefore decided first to compare siting options within geographic areas in pairs: i.e. LF-4N/PI-1N vs. LF-4N/PI-13N in Milton, LF-3C vs. LF-9C in West Lincoln, and LF-1E vs. LF-1E/PI-27E in Niagara Falls. The preferred options from each area were then compared in turn. This eventually narrowed the choice to one of the West Lincoln options (LF-9C) and one of the Niagara Falls options (LF-1E/PI-27E).

i) Stage 1: Comparing Siting Options Within Geographic Areas

Milton: LF-4N/PI-1N vs. LF-4N/PI-13N

The comparison of the two Milton options revealed a clear preference for LF-4N/PI-1N. On-site hydrogeologic investigations showed that PI-13N did not provide natural containment. LF-4N/PI-1N was clearly favoured for risk and impact concerns, whether on site, in the site vicinity, within the community and region, or along the access roads. The costs for the two options were equal.

West Lincoln: LF-9C vs. LF-3C

This comparison revealed a preference for LF-9C. Although both options ranked favourably for hydrogeology and air quality, the slightly greater potential risks for transportation and surface water at LF-3C made LF-9C preferable. LF-9C also had fewer environmental impacts on site in the site vicinity, or along the access roads. For potential community and regional impacts, both sites appeared equal. Costs at LF-9C were slightly greater, but the difference was not considered great enough to offset its relative advantages.

Niagara Falls: LF-1E vs. LF-1E/PI-27E

The comparison between the two Niagara Falls siting options involved several difficult tradeoffs but led to a final preference for LF-1E/PI-27E. For risks these two siting options were rated equal except for air quality, which favoured LF-1E (a fully integrated siting option), because PI-27E is closer to the urban residential areas of Niagara Falls. LF-1E/PI-27E had the advantage of minimizing most potential off-site impacts. Placing the incinerator and physical/chemical treatment plant at PI-27E would be more consistent with the proposed industrial designation for that site in the draft official plan of the City of Niagara Falls. This prospect of fewer unfavourable impacts at LF-1E/PI-27E

more than offset the slight advantage of LF-1E alone as minimizing risks and costs.

ii) Stage 2: Comparing Siting Options Between Geographic Areas

At the end of Stage 1 three options remained: LF-4N/PI-1N in Milton, LF-9C in West Lincoln, and LF-1E/PI-27E in Niagara Falls. The second stage involved a three-way comparison of these options.

LF-4N/PI-1N (Milton) vs. LF-9C (West Lincoln)

The comparison between these two options produced a preference for LF-9C on the basis that it minimized most potential risks, although the Milton option had an advantage for transportation risks. While LF-4N/PI-1N received a slight preference for potential impacts, OWMC's primary goal of minimizing risks to human health ranks higher than the secondary goal of minimizing environmental impacts. Although in theory major impact differences could offset very limited differences in potential risk, in practice the risk differences clearly favoured LF-9C while the impact differences only marginally favoured LF-4N/PI-1N, and accordingly LF-9C was considered preferable.

LF-4N/PI-1N (Milton) vs. LF-1E/PI-27E (Niagara Falls)

In the comparison between the preferred Niagara Falls and Milton options, LF-1E/PI-27E was favoured for potential risk, notwithstanding Milton's advantage for transportation risks. The Niagara Falls option was also favoured for potential impacts, while the Milton option was favoured for costs. The cost differences, however, did not appear great enough to offset the other clear advantages of the Niagara Falls option, and hence LF-1E/PI-27E was favoured over LF-4N/PI-1N.

Since LF-9C and LF-1E/PI-27E both appeared preferable to LF-4N/PI-1N, the Milton option was dropped from further consideration.

4. **Step 4: Choosing the Preferred Site**

Given that the site selection process had at one time involved 152 potential site areas and was gradually narrowed to a choice among eight candidate sites and finally to one between two siting options, it is not surprising that the final selection of LF-9C over LF-1E/PI-27E was difficult. The following synopsis of the final comparison between LF-1E/PI-27E in Niagara Falls, and LF-9C in West Lincoln will serve to illustrate this:

Potential Risks Favouring LF-1E/PI-27E

- o less potential exposure of crops, livestock, cisterns, and ponds;
- o fewer downstream water uses;
- o fewer potential risks along local and regional access routes.

Potential Risks Favouring LF-9C

- o greater hydrogeologic natural containment and greater certainty of geologic conditions;
- o lower potential for human exposure to air emissions through direct inhalation;
- o slightly better province wide transportation - an estimate of one spill every 10 years for LF-1E/PI-27E compared to one every 11 years for LF-9C.

Potential Impacts Favouring LF-1E/PI-27E

- o on-site: less potential impact on agricultural resources and more consistent with planned and proposed land uses;

- o site vicinity: less potential impact on non-adjacent residents, land use stability and agricultural resources, and more consistent with planned and proposed land uses;

- o community and regional: less potential impact on agricultural resources; more compatible with planned and proposed land uses;

- o local and regional access roads: less potential impact on residents and agriculture.

Potential Impacts Favouring LF-9C

- o on-site: less displacement of residents, businesses, and natural features;

- o site vicinity: less potential impact on community and recreation, natural environment, and businesses; more suitable air quality;

- o community and regional: less potential impact on tourism; more overall favourable impact on municipal finances.

Table 7.3 summarizes the risks and impacts favoured for each site.

All OWMC's site selection consultants indicated that either LF-9C or LF-1E/PI-27E would be acceptable. But the importance of risk factors, which OWMC believes should be given the greatest weight, finally determined the choice of LF-9C over LF-1E/PI-27E.

Protecting human health (as distinct from other impacts on the environment) has been the primary goal of OWMC's site selection process from the beginning. Although risk of any kind is small at modern waste treatment facilities, and the differences in potential impacts favoured the Niagara Falls sites, OWMC decided in favour of the reduced risks associated with the West Lincoln site.

The West Lincoln site provided greater assurance of natural containment. Although clay soils of the type underlying the Niagara Falls sites have considerable potential to provide natural

Table 7.3
Summary of Conclusions for Risks and Impacts, LF-9C vs. LF-1E / PI-27E

Source: M.M. Dillon (D6) Volume 2, Part 2

	LF-9C	LF-1E/PI-27E
A. Risk		
° Transportation		0
° Air Quality	0	
° Hydrogeologic Suitability	0	
° Surface Water Suitability		0
Overall Risk	0	
B. Environmental Impacts		
° Site	0	
° Site Vicinity		0
° Community and Regional		0
° Access Roads		0
Overall Impacts		0

0 = favoured

containment, analysis of the bore hole logs from the Phase 4A drilling program on LF-1E and PI-27E revealed some uncertainty about the predictability and uniformity of the geology there. This meant that even with further drilling, OWMC and the public could never have the same certainty about the integrity of the clay-textured soils underlying these sites as they could about the West Lincoln site. OWMC has stressed the importance of natural containment as a second level of protection for the environment throughout its site selection process, and this final comparison of sites clearly established that LF-9C offers greater assurance of providing that protection than LF-1E/PI-27E.

5. **Step 5: Confirmation of Comparative Evaluation**

Subsequent to the OWMC decision, the evaluation was further refined and documented by Dillon. Four evaluating procedures were employed. Each procedure served as a cross-check to the other procedures. The four procedures are:

- the identification of major differences and tradeoffs between siting options using a paired comparison process;
- the synthesis of disciplinary perspectives;
- two quantitative aggregation procedures.

A further cross-check against all four procedures was a series of quantitative and qualitative sensitivity analyses which assessed whether the conclusions would change under alternative assumptions and interpretations.

Each of the evaluation procedures and sensitivity analyses is documented in Dillon (D6) Volume 2, Chapters 5-8. A summary of each follows.

a) Differences and Tradeoffs Synthesis

The differences and tradeoffs synthesis used to compare and evaluate the six candidate siting options - LF-4N/PI-1N, LF-4N/PI-13N, LF-3C, LF-9C, LF-1E, LF-1E/PI-27E - represents an extension and refinement of the paired comparisons highlighted in the detailed comparative evaluation.

The principal characteristics of the differences and tradeoffs synthesis include the following:

- a staged comparison to minimize the amount of data and the number of choices addressed at one time;
- a staged process for each pair of siting options to identify major risks and impacts, to identify major differences between pairs of options and to evaluate tradeoffs between options;
- a staged process for comparing pairs of options;
- the use of data and interpretations derived from the site selection consultants' technical analyses;
- the systematic incorporation of public and agency concerns into the comparison process;
- the presentation of the synthesis by means of a series of reasoned arguments supported by data and interpretation summarized in tabular form.

The process of comparing the siting options took place in three steps - the comparison of siting options within geographic clusters, the comparison of the preferred siting options from each geographic cluster and the final comparison of the two most preferred siting options.

b) Synthesis of Disciplinary Perspectives

In Phase 4A each consultant was responsible for synthesizing their analyses and interpretations and for ranking the siting options. This ranking procedure gave each consultant the opportunity to derive an overall disciplinary/professional perspective.

The disciplinary integration process was split into two main streams of activities - one concerned with risks to human health and the other with environmental impacts. In both activity streams, the process began with the rationale for the ranking of siting options prepared by the consultants, together with the overall ranking of factors. Once overall risk and impact siting option rankings were derived, the tradeoffs among the risk, impact and engineering cost and flexibility rankings were evaluated.

In evaluating the various arguments for and against different positions, the following distinctions were made:

- o absolute risks and impacts;
- o relative risks and impacts;
- o mitigation potential;
- o uncertainty;
- o policy; and
- o factor rankings.

c) Quantitative Aggregation of Factors

In the quantitative aggregation procedures, site selection risks and impacts were combined or aggregated by summing the products of factor rankings and factor suitability levels.

The quantitative aggregation process began with a review of the procedures employed by the consultants to combine their indicator and factor rankings with their indicator and factor suitability levels. A number of adjustments were made to ensure consistency

and for the combining of impact factors on a study area and a disciplinary basis.

Risks were aggregated by risk pathway. Impacts were aggregated by both study area and discipline. The initial step in each case was the calculation of a hypothetical best siting option. The hypothetical best siting option is the sum of the best factor suitability levels for the most preferred siting option for all factors. This served as a benchmark against which the siting options could be compared.

Factor suitability levels and factor rankings were then aggregated. For example, risk factors were aggregated for each risk pathway by summing products of factor ranking and suitability level (i.e. factor scores) and by dividing by the number of factors for each siting option. Reasonable error limits of 1 percent and 5 percent of the mean factor scores were applied to the factor scores. The resulting numbers were displayed in graph form. The results derived by the individual consultants were cross-checked. Finally, overall conclusions were derived.

d) Sensitivity Analyses

A large number of sensitivity analyses were undertaken to determine the sensitivity of siting option rankings to alternative assumptions and interpretations. These sensitivity analyses represented a cross-check of interpretations and conclusions addressed in factor ranking and in siting option comparison.

The sensitivity analyses, where possible, extended from the quantitative aggregation of factors. Not all sensitivity analyses were addressed quantitatively. In a number of instances, it was only possible to adjust siting options rankings or the differences between siting options in a qualitative fashion.

Comparative Evaluation Conclusions

The overall conclusions of the comparative evaluation are presented in Dillon (D6) Volume 2, Chapter 9. A summary of these is provided below.

1. Milton Siting Options - The Milton siting options are clearly less suitable than the other four siting options. This pattern is maintained across all evaluation procedures. It is also reflected in the limited sensitivity of the ranking of the two options to changes in assumptions and interpretations.

   Of the two Milton siting options, LF-4N/PI-13N is less suitable, because it fails to ensure natural containment. As a result, LF-4N/PI-13N is basically unacceptable.

2. LF-3C in West Lincoln - Of the four remaining options, LF-3C is the least preferred. The major reasons for this conclusion include the following:

   - LF-3C is the least desirable siting option from a transportation and flood susceptibility risk perspective. LF-9C shares LF-3C's natural containment and air risk advantages. However, LF-9C does not share, to the same extent, its transportation and surface water risk disadvantages.

   - LF-3C is ranked fourth overall for impacts in the disciplinary synthesis and in the quantitative aggregation by discipline. LF-3C is ranked sixth overall for impacts in the quantitative aggregation by study area. LF-9C is preferred to LF-3C in the differences and tradeoffs synthesis.

   - LF-3C is ranked third or fourth in the quantitative aggregation by study area for site, site vicinity and community and regional impacts. It is ranked sixth in the quantitative aggregation for access road impacts.

- o LF-3C is ranked as the least desirable siting option by the agricultural and social consultants. It is also ranked fourth overall by the land use, economic base and biology consultants. Of the impact consultants, LF-3C is only highly ranked by the municipal finance and air impact consultants. Municipal finance and air impacts involve moderately ranked factors. In both cases, these advantages are also possessed by LF-9C. However, LF-9C does not possess, to the same extent, the impact disadvantages associated with LF-3C.

3. LF-9C in West Lincoln and LF-1E and LF-1E/PI-27E in Niagara Falls - The choice among these three siting options involves some difficult tradeoffs and interpretations. The limited differences across the options are reflected in the different results which emerge, depending on the synthesis or aggregation procedure employed. It is also evident in the ranking variations which occur when different sensitivity analyses or combinations of sensitivity analyses are employed. The major advantages of each of these siting options are highlighted in Dillon (D6) Volume 2, Chapter 9, Table 9.2. A much more detailed description of the advantages and limitations of these three siting options is presented in Dillon (D6) Volume 2, Chapters 5 and 6.

Chapter 8:
Conclusion - Advantages and Disadvantages of the Undertaking

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Conclusion - Advantages and Disadvantages of the Undertaking

In Chapter 4 of this Environmental Assessment, alternatives to OWMC's proposed undertaking were identified and evaluated. OWMC's proposal and the no-action alternative were taken as the bases for comparison. In the final ranking, the OWMC proposal to construct and operate treatment and disposal facilities was superior to all alternatives because it can deal most successfully with the problem of special waste while minimizing risks and impacts. The no-action alternative was ranked last because, by definition, it would result in a continuation of the hazardous waste problem in Ontario, which urgently requires solutions as concluded in Chapter 3. Chapter 4 concluded that there is clearly a role in Ontario for publicly owned treatment and disposal facilities, and that these might be supported by elements of other alternatives, such as a strong 4R program.

In Chapter 5, a strategy was developed to focus the OWMC marketing effort on priority wastes selected to maximize environmental benefits while minimizing the economic impacts on the existing private waste management sector.

In Chapter 6, it was shown how alternative technologies were evaluated against OWMC's selection criteria which place high priority on minimizing risk to human health and impact on the environment. The selected technologies were then optimized and brought together into a conceptual design with the capability both to treat a broad range of special wastes and to meet high environmental standards for emissions and effluents.

Chapter 7 discussed how an environmental setting appropriate to the emerging facility design has been sought in successive steps of the site

selection process. At each successive step, only those alternatives which ranked highest, in terms of having the most positive balance of potential advantages and disadvantages to the environment, were advanced to the next stage. In the final step, site LF-9C was chosen over other potentially acceptable siting options because it best meets the primary facilities development goal of minimizing risk to human health.

The result of this process is a conceptual design and site chosen to minimize potential negative effects on the environment. Nevertheless, as with any activity that changes the environment, there are both positive and negative effects.

This chapter begins with a description of the characteristics of the proposed conceptual design that are relevant to its potential environmental effects. Next it reviews the existing environment at LF-9C and describes the site assessment work in process which will be presented in detail in the Implementation Stage EA. Then it describes presumed effects on the provincial environment. This description will be supported by several studies OWMC intends to file in early 1987 in support of this Plan Stage EA. The chapter concludes with a statement of the rationale for the proposed undertaking.

A. FACILITY CHARACTERISTICS

As a result of the evaluation of alternative technologies and the selection and optimization of combinations of technologies as described in Chapter 6, a conceptual facility design has been finalized by OWMC. This is summarized in Chapter 2 - Description of the Undertaking.

The following sections outline the characteristics of the integrated, 150 000 t/a facility, during the initial start-up and operation periods. Additional information is provided for a 300 000 t/a facility where required for sensitivity analyses.[1]

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[1] Sensitivity analysis is the evaluation method to determine the effect of different facility assumptions (e.g. rail versus road access, total versus partial solidification) on the ranking of the siting options.

The detailed facility characteristics are described in Chapter 5 of OWMC treatment Facility/Facility Description, 1986 by Monenco, (C1).

A summary of the facility characteristics is provided under the following headings:

- initial start-up of the facility;
- operation of the facility:
  a) transportation requirements, waste quantities and characteristics,
  b) emissions and effluents,
  c) engineered containment,
  d) anticipated noise levels,
  e) visual appearance,
  f) dust,
  g) hours of operation,
  h) employment levels,
  i) services for the facility.

1. Initial Start-up of the Facility

Upon completion of construction, component systems of the facility will be pressure/seal tested in accordance with applicable codes and specifications, followed by cleaning of component systems and general site clean-up. Activities prior to start-up, such as installation of on-line instruments, running in of equipment and "ready for start-up" checks will follow.

The incineration plant will be started up first on auxiliary fuel prior to the introduction of waste material, under conditions as close to normal operations as possible. During this testing, all plant components will be checked carefully to demonstrate the performance levels of each component as well as the plant as a whole. The initial start-up procedures will ensure that all operating parameters are maintained within acceptable limits. The plant will be shut down immediately if these limits are exceeded for longer than pre-determined periods.

The performance testing of the incineration plant will demonstrate that the plant can operate safely and that the emissions are within acceptable levels for normal operations.

Initial start-up of other continuous operating systems (e.g. vent and emission control system) will be in accordance with established procedures. Emissions will be monitored to ensure that they are operating within acceptable limits for normal operations.

The physical/chemical treatment and solidification plants are operated in a batch mode, whereby initial start-up activities are essentially the same as those for normal operations. The performance of these batch operating processes can be predetermined by treatability tests in the laboratory. Emissions from these plants will be within the acceptable levels established for normal operations.

2. Operation of the Facility

The characteristics associated with operation of the facility are based on a 150 000 t/a facility operating in year 5 with exceptions noted to account for the build up during the first five years of operation.

a) Transportation Requirements

Quantity of Special Waste

The quantity of special waste to be treated at OWMC's treatment facility will increase to 150 000 t/a by year 5 as follows:

QUANTITY OF SPECIAL WASTE (t/a)

Year of Operation	Total	Organic	Inorganic
1	50 000	20 000	30 000
2	70 000	20 000	50 000
3	105 000	25 000	80 000
4	130 000	30 000	100 000
5	150 000	30 000	120 000

If the facility is not expanded, quantities will remain constant every year at the levels shown for year 5.

If the facility is expanded to 300 000 t/a, the quantities to be treated are assumed to increase from year 6 to year 10 as shown below and remain constant at these levels in subsequent years, for the life of the treatment facilities.

QUANTITY OF SPECIAL WASTE (t/a)

Year of Operation	Total	Organic	Inorganic
6	180 000	36 000	144 000
7	210 000	42 000	168 000
8	240 000	48 000	192 000
9	270 000	54 000	216 000
10	300 000	60 000	240 000

Characteristics of Special Wastes

The assumed characteristics of the 150 000 t/a of special wastes are presented in Monenco, (C1), Appendix A.

Transportation of Special Wastes, Additives and Reagents

The quantities of special wastes are shown on Table 5.1 and quantities of additives and reagents are shown on Table 5.2 of Monenco, (C1).

b) Emissions and Effluents

Emissions and effluents are defined as gaseous and liquid discharges, respectively, which are released from the facility. These include:

- o emissions from the incineration plant stack;
- o emissions from the evaporator stack;
- o fugitive atmospheric emissions;

- o sanitary sewage effluent;
- o uncontaminated surface drainage.

Stack and Fugitive Atmospheric Emissions

Expected stack emissions from the incinerator and evaporator are presented in Monenco, (C1) p.260, and p.263. respectively.

Site Selection Process Phase 4A - Selection of a Preferred Site(s) - Engineering, 1986 by Monenco, provides an assessment of the fugitive emissions associated with the proposed facility.

A more detailed assessment is presently being conducted based on the conceptual design described in this report. Additional work is presently being conducted by other OWMC consultants to address compliance of the facility emissions with Ontario regulations and to determine health risks resulting from such emissions. This work undertaken by Ontario Research Foundation and Environ Corporation, respectively will be available in 1987.

Sanitary Sewage Effluent

Sanitary sewage from the site will be treated on-site and the treated effluent will be discharged with the uncontaminated surface drainage.

Uncontaminated Surface Drainage

The on-site uncontaminated surface drainage (clean storm water) will be monitored and controlled on-site and discharged off-site to the Welland River via a sewer as shown in Monenco, (C1), Table 5.7 and Figure 3.4.

c) Engineered Containment

Engineered containment is described in Chapter 3 of Monenco and additional information is provided in Site Selection Process,

Phase 4A - Selection of a Preferred Site(s) - Engineering, 1986 by Monenco.

d) Anticipated Noise Levels

The anticipated noise levels were estimated for the facility equipment and are shown in Monenco, (C1), Appendix C.2 and Figure 3.2.

The anticipated noise levels associated with operation of the landfill are also provided in Monenco, (C1), Appendix C.2.

e) Visual Appearance

The appearance of the facility is determined by numerous features such as height, shape, colour, texture and finish to the buildings and structures. A general understanding of these features can be obtained by reference to the following.

- A perspective of the 150 000 t/a integrated facility is shown on Figure 2.1 of this EA.
- Figures 3.2 and 3.3 of Monenco, (C1) show the site layout and the central operating area within the overall site, with the remaining area of the site used for landfill.
- Building and pond sizes are summarized in Table 5.3 of Monenco, (C1).
- The facility will be enclosed by a 3 m high chain link fence. Fencing will be around the central operating area, and around the site acquisition boundary.
- Figure 8.1.
- The landfill will be of the shallow entombed type and will be developed by the area method;

- The limits of landfill development will be at least 50 m from the site acquisition boundary.

- Provision will be made for a 5 m high berm around the site, located just inside the fence.

- Landfilled areas will be revegetated. The lag time between closing an area and establishing vegetation is approximately one year.

- The central operating area and roadways will be illuminated at night with lighting focused downwards.

- The incinerator stack will be illuminated in accordance with the requirements of Transport Canada, which requires two red dual unit flashing hazard beacons located 2 m below the top of the stack and two dual unit red steady burning obstruction lights at the half way point. The lights must be visible from any angle around the stack.

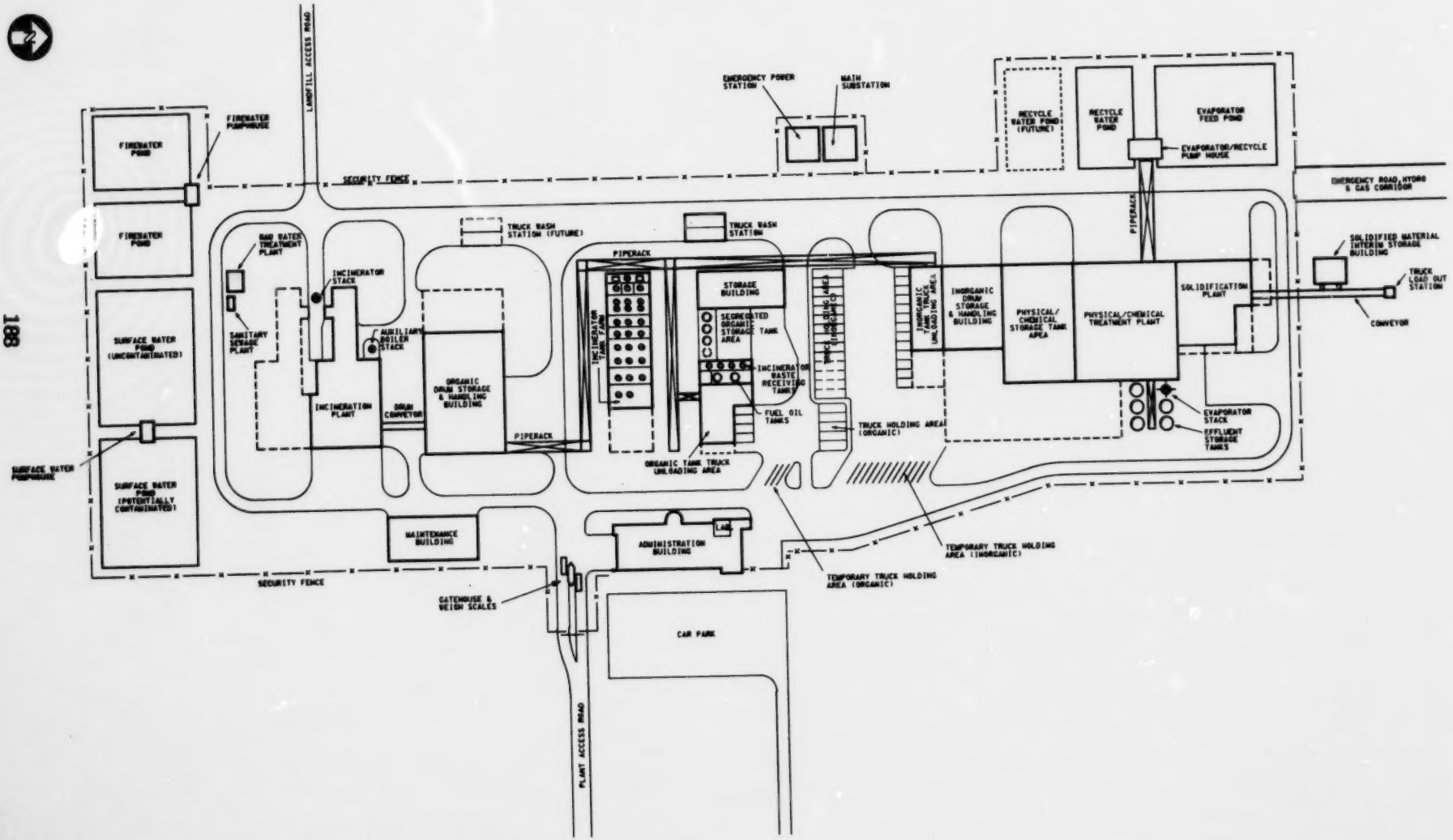
- Landfill operations are planned for daylight hours. Local mobile lighting units will be provided for safety should any night deposition of solidified material into the open landfill area be required.

- The concrete stack for the first incinerator installation will contain one flue and will exude a plume of condensate during certain operating and climatic conditions. This will be visible at most times during the year, but will be more visible in cold weather.

  The expanded facility with a second incinerator will utilize the same stack with a second flue. The outward appearance of the stack will therefore not change.

  The additional flue will contribute to an increase in the volume of discharge.

Figure 8.1
Arrangement of Central Operating Area
Source: Monenco (C1) Fig. 6



- The evaporator discharge is a single stack which may be supported from the Physical/Chemical Treatment Plant building and be free standing above the roof line. Consideration will be given to it being of similar construction to that of the incinerator stack.

- The auxiliary boilers will use oil or gas as a fuel.

  In the case of oil, a significant plume of smoke from the auxiliary boiler stack is not expected, and is not likely to be visable from outside the facility boundary.

  If gas is used as the fuel, a plume is expected due to moisture in the gas and this plume will be particularly visible during cold weather.

- Various piping systems and vessels in the steam and condensate system will be fitted with relief valves that exhaust via a pipe to the atmosphere. In the event of an operating upset resulting in the activation of a relief valve, a steam or condensate exhaust plume will become visible for a short duration.

  The height of the vent pipes is generally 30 m above grade. The vents will normally extend to approximately 3 m above the roof line of buildings.

  At this conceptual stage the location of these relief valves and discharge vents from the steam and condensate system has not been determined.

f) Dust

The potential sources of dust at the facility are summarized as follows:

- Excavation and stockpiling of soils during initial area development:

- Potential for dust generation is low because soils will have high moisture content.
- Frequency - continual.

o Desiccation of stockpiled soil from on-going operations and wind generated dust:

- This is a possibility and can be controlled through the use of soil stabilization agents or grassing of stockpiles.
- Frequency - variable.

o Dust generation by vehicles while filling landfill area:

- This is a possibility since most of the solidified material will be trucked to landfill.
- Source could be either road dust or dust from exposed surfaces of solidified mass that are subject to traffic.
- Road dust will be minimized by the use of good all weather road surfaces and application of dust control chemicals or water applied to road surface.
- Regular road cleaning and maintenance will help to minimize dust.
- Dust generated from the solidified mass by wind or vehicular traffic will be controlled by minimizing the time of exposure of surfaces.
- Frequency - continuously.

o Dust generated by handling and placement of clay and topsoil during placement of final cover over filled areas:

- Although stockpiled materials are likely to have reasonably high moisture content there is some potential for dust generation, but it would be of short duration.
- There is also a potential for dust generation by wind until the vegetation cover is established on the topsoil. This will be minimized through the use of soil stabilizing agents as required.
- Frequency - continuously.

- Specific dust sources at the facility are presented in Monenco, (C1), Tables 5.4 and 5.5.

g) Hours of Operation

Incineration Plant

- Operation will be 24 hours/day, 7 days/week, 7 000 hours/year.

Physical/Chemical Treatment Plant

- Operation for 50 000 t/a will be on the basis of 8 hours/day, 5 days/week, 50 weeks/year. Increased capacity will be handled by working additional hours to the maximum of 24 hours/day, 5 days/week.

Solidification Plant

- Operation will be 8 hours/day, 5 days/week, 50 weeks/year. Increased capacity will be handled by working additional hours to the maximum of 24 hours/day in accordance with the requirements of the physical/chemical treatment plant.

Engineered Landfill

- Operation of the landfill will be 8 hours/day, 5 days/week, 50 weeks/year.

- Transportation of material from the central operating area to the landfill by pipeline or trucks will be 8 hours/day, 5 days/week, 50 weeks/year.

- Transportation of material from the solidification plant to the landfill by pipeline could be up to 24 hours/day, but landfill operations using heavy equipment, such as bulldozers and compactors will be during daylight hours only.

h) Employment Levels

- The total employment level for the 150 000 t/a facility is estimated at approximately 150 persons.

- A breakdown of employment by job description is given in Monenco, (C1), Table 5.6.

i) Services for the Facility

- Services required for the operation of the facility include:

  - surface water drainage discharge (clean storm water),
  - sanitary sewage discharge,
  - water drawn from watercourses (raw water),
  - auxiliary fuel,
  - electric power, and
  - telephone.

- Services will use existing road allowances for routing, where possible, and will be buried, except for electric power which will use overhead pole lines. Services are listed in Monenco, (C1), Table 5.7 and shown on Figure 3.4. Additional information is presented in "Off-site Tie-ins" in Appendix C.1 of the same report.

B. LOCAL ENVIRONMENTAL EFFECTS

This section describes the existing environment of the site, the vicinity and the region around it. It describes work in progress concerning potential local environmental effects and ways to mitigate them.

1. Existing Environment: Major Characteristics of The Site and Vicinity

A detailed description of the existing environment at the site, in the site vicinity, in the surrounding community and region and along the access roads can be found in Dillon, (D6), Vol. 2, Chapter 2, pp.42-49. A summary of the main features follows:

a) The Location of the Site

The site is located in the Township of West Lincoln in the Regional Municipality of Niagara. The site is 124 ha and is bounded on the north by Highway 20, on the east by Schram Road and on the south by Vaughan Road (see Appendix C - Legal Plan of Survey). Its location is shown in Figure 8.2. This figure also shows the preferred regional and local access route to the site.

b) Major Site Characteristics

Hydrogeology: The data obtained from drilling on and around the site and field investigations show that the site is underlain by a deep, uniform and continuous layer of clay-textured soils which will retard the movement of potential contaminants from the site.

Surface Water: The potential for on-site flooding from watercourses draining through the site or adjacent to the site is low. Field studies revealed that no surface water is being used for potable supplies in the downstream site vicinity. Potable water supplies are usually taken from local cisterns and ponds.

Air Quality: Existing and anticipated air quality characteristics in the area are good. The site is well removed from existing sources of air pollution and there are no constraints to the dispersion of air emissions in the area.

Figure 8.2
Preferred Site
Source: OWMC, Phase 4A Report,1985

Transportation: The site is more constrained than some of the other siting options with regard to transportation, requiring trucks to travel further on regional roads between provincial highways and the site. Portions of these roads have clusters of homes in close proximity to the roadway and pass through the community of Vineland. There are also three major stream crossings and seasonal movement of agricultural equipment along the regional access routes.

OWMC has identified the preferred access route (Figure 8.2). Between 4 500 and 7 000 vehicles travel along the Regional Road 24 section of the access route each day. Approximately 18 percent of these vehicles are heavy trucks. Just under 3 000 vehicles per day travelled the Highway 20 section of the access route and about 450 of these are heavy trucks.

There are an estimated 775 people living adjacent to the access route and just over 1 700 residents within 800 m on both sides.

Agriculture along this route ranges from orchards and vineyards along the north half of Regional Road 24, to a mix of cash crop, dairy and poultry farms along the southern half and along Highway 20. Customer stops are relatively frequent and farm traffic along these routes is moderately heavy.

There are 14 community and recreation features located adjacent to the access route and another 11 within the route's vicinity.

Agriculture: The site is located in a stable farming area. Agricultural use, reflecting a mixed agriculture of livestock, poultry farming and varied crops, is extensive in the area surrounding the site. Most of the land is in large parcels and there is a low percentage of rented land, which reflects the stable nature of the area. Two farm headquarters are located on the site. Most of the land on-site is tillable, with the predominant farming activities involving livestock and hay crops. However,

clay soils and flooding potential limit its value as agricultural land. Livestock production is extensive with six farm headquarters located adjacent to the site and 23 farm headquarters in the site vicinity. There are 35 farm headquarters along the access route consisting of fruit, dairy cattle, poultry and cash crop operations. In addition to these agricultural operations, there are a number of centres serving the agricultural community in the area.

Population: There are two households on the site and 37 homes within 1 000 m of the site. The largest community along the access route from the QEW to the site is Vineland with an estimated population of 1 150. There are also industrial and commercial uses and several community and recreational features scattered along the access route. Six of the 14 community and recreational features - a school, a conservation area, a campsite and three churches - are considered to be sensitive.

Biological Features: There is a small woodlot and some disturbed field areas on the site. There are approximately 61 ha of natural vegetation. Six rare plant species and five uncommon animal and bird species have been identified on the site. Rare is defined in a broad sense and covers such designations as endangered, threatened and regionally, provincially or nationally rare. No species listed in the Endangered Species Act are known to occur on the site.

Archaeological Features: There are three archaeological features on the site. One feature consists of a series of chert flakes (flint chips) and an arrowhead. The other two features consist of non-standing historic sites. These include the remains of an historic residence, and a reported, but unconfirmed, blacksmith shop.

2. Potential Environmental Effects and Mitigation: Local Level

Even though the facility will be designed and operated within strict environmental standards, there is no doubt that the construction

and operation of the facility will affect the West Lincoln site itself and to varying degrees the surrounding community. Any industrial activity will have some effect on its surrounding environment and OWMC's proposed facility is no exception to this rule. Certain impacts, such as displacement of on-site residents, are unavoidable and will cause some hardship for those affected.

OWMC is continuing work to define the full extent of effects on the people and environment of West Lincoln and to identify ways and means of preventing or minimizing potential problems. A consideration of the effects on the local environment as described in these studies will be included in the Implementation Stage EA. A description of the studies of local environmental effects which will be included in the Implementation Stage EA is as follows:

i) Atmospheric

The principal objectives of the atmospheric testing are to:

a) define more precisely the existing air quality;

b) further document the local dispersion patterns to permit predictive modelling;

c) provide further data which will permit the assessment of potential environmental impacts; and

d) provide further information to assist in emission control measures to ensure mitigation of adverse impacts.

Baseline atmospheric data are being collected on-site with a comprehensive meteorological station consisting of a 30 m tower and trailer. Both tower and trailer contain an array of meteorological and air quality probes and sensors, continuously recording and transmitting data to an off-site computer synthesizer. In addition, a number of periodic special studies are being conducted, including upper air minisonde measurements, and lower level background scans of

atmospheric trace organic constituents using a TAGA mobile unit facility.

ii) Subsurface

The subsurface investigations are designed to provide detailed information on the composition, stratigraphy, uniformity and predictability, and the hydrogeologic and geotechnical characteristics of the soils and rock underlying the site. This information is being used to confirm the suitability of the site in terms of natural ability to retard leachate movement, as well as to assist in designing the landfill and selected aspects of the treatment facilities, and to compile an assessment of potential environmental impacts.

Subsurface investigations include seismic and electromagnetic geophysical surveys, geologic drilling and core evaluation, geochemical field and laboratory analyses, and long-term ground water quantity and quality monitoring. Field investigations on-site are clustered at 12 locations on-site, and four locations off-site. The seismic geophysical survey extends about 1 km off-site in each direction along the road allowances.

iii) Biology

The existing biological environment is being documented further to predict impacts resulting from the construction and operation of the proposed OWMC facility. The focus of the study is the vegetation and wildlife at the site and in the vicinity. The study involves sampling of plants and trees and the identification of species. Wildlife are being inventoried through observations or sampling where appropriate.

iv) Surface Water

Baseline conditions are being documented to predict impacts to surface water resources in the vicinity of the site. The

study involves collecting and updating information on water use, water quality, quantity and snow quality on and in the vicinity of the site, immediately downstream and at two locations on the Welland River.

v) Transportation

Transport risks are being assessed along the proposed access route (Regional Road 24 and Highway 20). Traffic volumes and accident and spill rates are being evaluated further, and accident prone areas are being identified. This information is being obtained through the appropriate responsible agencies (Ministry of Transportation and Communications and the Regional Municipality of Niagara) and field counts.

The incremental risk associated with the forecasted additional OWMC related traffic is being calculated against the existing traffic volumes. Recommendations will be made regarding traffic control and road improvements.

Associated with the transportation study is the noise assessment. Noise measurements along the access route are being taken in order to define the existing noise levels. The increase in noise levels will then be calculated by using the forecasted OWMC related traffic volumes. In addition, the background noise levels around the preferred site are being measured and calculation of future noise levels will be used to mitigate potential noise from the proposed facility.

vi) Land Use

Land use data and a field survey of the site and vicinity are being consolidated and mapped. The existing and projected population structure and distribution in the community and region is being identified further.

vii) Heritage and Archaeological Research

The number, extent, and significance of both native archaeological, non-standing historic Euro-Canadian sites and standing heritage features are being assessed.

viii) Agriculture

Socio-economic factors which will serve to assess short and long term impacts on the community are being identified based on a questionnaire survey of farm operators.

The potential for effects on the marketability of crops and livestock caused by consumers' concerns with respect to facility emissions are being analysed through research and interviews with marketing boards and consumer groups. Information is being gathered on farming activities that could be affected by public fears of contamination of streams by spills at the site.

ix) Social Analysis

Baseline data on the community is being derived from secondary sources, agency contacts, a community survey, and interviews with community representatives. An impact assessment is identifying changes in population characteristics, changes to patterns of social interaction and quality of life and attitudes, perceptions and concerns of community groups attributable to the establishment of OWMC's facility in West Lincoln.

x) Economic and Municipal Finance Assessment

Integral to the social assessment will be an analysis of the economic base of the community. This includes an analysis of potential impacts to wage levels, employment, labour supply, multiplier effects, land values, and commercial and farm businesses. Potential changes to the municipal fiscal condition

of the area and regional municipalities concerning tax revenue, assessments, changes to grant structure and capabilities of municipal services are being studied for short and long term trends.

xi) Human Health Assessment

The possible effects of the facility on human health are being estimated. This includes a consideration of the major sources of potential contaminant release (incinerator stack, evaporator stack, fugitive emission, landfill leachate and transportation spills); the movement of these contaminants through the environment; human exposure through air, food and waste; and a comparison of this exposure with effects indicated in the toxicological literature.

This will serve as a means both to further assess the risks in relation to normally accepted levels, and to identify and assess possible areas in need of mitigation.

The completion of the work outlined above will give OWMC an accurate picture of the biophysical and socio-economic conditions on and around the site and along the access road. The findings resulting from this work are being discussed with the public throughout Phase 4B.

C. PROVINCIAL ENVIRONMENTAL EFFECTS

The previous Section referred to OWMC's continuing work on the environmental effects of the proposed waste treatment facilities on the West Lincoln site and its surroundings. The results of this work will be included in OWMC's Implementation EA. This Section considers the environmental effects on the Province of Ontario of OWMC's proposal set forth in this Plan Stage EA.

The following description of effects on the provincial environment is based on the judgement of OWMC's management and experts supported by several years of analysis, study and discussions. This has been based both on public data and data obtained by OWMC in its research.

OWMC has held discussions with MOE officials and other officials in the Ontario waste management sector. This description of effects reflects OWMC's best opinion at this time and will be supplemented by several specific OWMC studies on provincial effects which will be filed in 1987.

1. Existing Environment: Provincial Level

The description of the existing environment to be affected by the proposed waste treatment facilities is provided in Chapter 3. The characteristics of special waste, the distribution of waste generation, and the various factors influencing the ultimate destination of special waste have been described. The effects of contaminants present in special waste on the environment were also reviewed. The Chapter concluded that the inappropriate disposal of special waste represented a sufficiently serious threat to the environment that solutions needed to be sought.

2. Potential Environmental Effects and Mitigation: Provincial Level

The environmental effects of significance at the provincial level are described below.

a) Effect on Special Waste

In Chapter 5, the "waste management gap" between the present systems of treating waste and what could be implemented using better technology in conjunction with more stringent standards was estimated to be in the order of 300 000 t/a for organic wastes and 500 000 t/a for inorganic wastes. OWMC's facilities have the capacity to increase the quantity of wastes treated to 30 000 t/a of organic wastes and 120 000 t/a of inorganic wastes before an

expansion is required. The proposed site and its engineering services are sized to accommodate an ultimate capacity of 300 000 t/a.

Discussions currently are underway between the Ministry of the Environment and OWMC on the nature of the regulatory environment which should accompany the entry of the OWMC facilities into the waste management market in order to ensure that the facilities provide maximum environmental benefits.

Assuming that regulatory changes will result in OWMC facilities receiving quantities of waste sufficient to utilize their capacity, the removal of these volumes of waste from inappropriate destinations will have a significant positive effect on the Ontario environment. The initial capacity of OWMC facilities represents roughly 10 percent of special wastes estimated to be generated in Ontario annually. With OWMC's proposed market strategy of concentrating on priority wastes, these volumes indicate that the facilities have the potential to provide significant beneficial effects.

b) Effect on Waste Generators

New regulation trends will result in a general increase in the price of off-site waste treatment and disposal. Waste management costs are generally such a low proportion of the total operating costs of industry that this rise in treatment prices is unlikely to affect the economic viability of most generators. Nevertheless, it is expected that the increase in the cost of off-site treatment and disposal will make on-site options, such as abatement, reduction, recycling or re-use, and recovery more attractive. To the extent that this happens, the facilities will be instrumental in moving generators to more preferable approaches within the waste management hierarchy.

c) Effect on Waste Treatment Industry

The regulatory actions necessary to direct wastes to the most appropriate level of the waste management hierarchy are likely to have a positive benefit for the overall waste treatment industry. OWMC's facilities may have a negative effect on the private waste treatment industry initially, but OWMC proposes to mitigate this potential negative effect by concentrating its marketing effort on priority wastes. This will leave room for the existing waste treatment industry to continue managing those wastes for which they have appropriate technologies.

d) Effects on Waste Haulers

The entry of OWMC's facilities into the market is expected to have a positive effect on the waste haulage business. OWMC will require that wastes be shipped to it only by haulers who have been prequalified as meeting high standards of driver training and equipment maintenance. This is expected to increase the general level of service in the waste haulage industry at large.

3. Additional Specific Studies

As mentioned above, OWMC awaits the completion of several studies relevant to the effects of OWMC's plans and proposal on the provincial environment. The following is a description of the work currently underway.

a) Economic Impacts

This study takes into account various economic considerations. It is intended to provide an assessment of the economic impact of OWMC's proposal on waste generators, private waste treaters, waste haulers, and the Province.

This study is applying standard economic methods and data from OWMC Market Assessment Program data, supplemented by other data supplied by the consultants. Conclusions will be drawn about the effect of OWMC's proposal under a range of scenarios.

b) Provincial Health and Environmental Effects

This study will provide an assessment of the health and environmental impact of OWMC's proposal on the Province as a whole. It will consider total environmental loadings, using the data from OWMC's Market Assessment Program, supplemented by other data supplied by the consultant. Conclusions will be drawn about the effects of OWMC's proposal under a range of scenarios.

c) Co-ordinated Benefit/Cost Analysis

This study will synthesize the data and analyses from the above two studies on human health risks and environmental loadings, the economic implications of various OWMC market scenarios, and the local risks and impacts.

The study will have five parts:

- o provide a framework to integrate the economic and human health analyses,
- o identify the types of benefits and costs that will result from the project,
- o identify the key assumptions (cases) governing the magnitude of the benefits and costs,
- o develop measures and data requirements for each benefit and cost,
- o compile data and present results.

The report will conclude with a comparison of the benefits and costs and the net impacts of the undertaking.

D. RATIONALE FOR THE UNDERTAKING

The purpose of the EA Act is the betterment of the people of Ontario by providing for the protection, conservation and wise management in Ontario of the environment. OWMC is confident that its undertaking meets this statutory purpose.

In light of the undertaking which is documented here, OWMC believes that it has demonstrated that this Plan Stage undertaking is the most desirable course of action in terms of both positive and negative effects on the environment for the following reasons:

- There is a special waste problem in Ontario. The threat to the environment of contaminants released from these wastes is a serious one, which requires the attention of all those involved in waste management. OWMC was created to contribute to solving this problem (Chapter 3).

- OWMC's proposed centralized treatment and disposal facilities are needed to deal with the problem of special waste in Ontario as part of an overall solution. This conclusion is reached after a full consideration of alternatives to OWMC's undertaking (Chapter 4).

- The consideration of alternative methods of carrying out OWMC's plan stage undertaking, with respect to technology selection, has led to a conceptual design which is state of the art for hazardous waste treatment facilities in the world (Chapter 6).

- The consideration of alternative methods, with respect to siting, has resulted in the selection of a site which is not only safe and suitable, but is also superior to alternative siting options (Chapter 7).

- At the provincial level, the proposed facilities will have a beneficial effect in diverting special wastes to appropriate treatment technologies, and in encouraging generators to deal with special waste at the most appropriate level of the waste management hierarchy (Chapter 8).

- Finally, at the local level, the effects of concern are largely a result of locating an industrial facility in a rural setting. Mitigation and compensation measures now being considered are expected to alleviate impacts of concerns, and these will be addressed fully in the Implementation Stage EA (Chapter 8).

For the above reasons, OWMC submits that its proposed undertaking will have a net beneficial effect on the Ontario environment. It is preferable to all alternatives and the conceptual facilities chosen and the site selected for OWMC's proposed facilities are the best of the alternative ways of carrying out OWMC's undertaking. Any adverse effects will be minimal. OWMC, therefore, submits that it should be authorized to carry out this undertaking subject to a favourable consideration of OWMC's Implementation Stage EA to be submitted later.

Appendices

Appendix A:
OWMC Act

Appendix B:

Order-in-Council 1779/85

Ontario

Executive Council

O.C. 1779/85

I hereby certify that the attached is a true copy of an Order made upon the 12th day of July, A.D. 1985, by His Honour the Honourable John Black Aird, O.C., Q.C., B.A., LL.D., Lieutenant Governor of the Province of Ontario in Council.

Assistant Clerk, Executive Council of Ontario

Dated at Toronto,
this 19th day of
August, A.D. 1986.

Ontario
Executive Council

Order in Council

On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and concurrence of the Executive Council, orders that

WHEREAS subsection 15(1) of the Ontario Waste Management Corporation Act, 1981 (the "Act") provides that activities, enterprises or facilities of Ontario Waste Management Corporation ("the Corporation") authorized by order in council under section 14 of the Act are not subject to the provisions of the Environmental Assessment Act or of sections 30 of the Environmental Protection Act and 25 of the Ontario Water Resources Act (which provide for hearings) and,

WHEREAS subsection 15(3) of the Act provides that subsection 15(1) and subsection 15(2) (which is spent) of the Act shall cease to apply on a day to be named by proclamation of the Lieutenant Governor, and

WHEREAS pursuant to Order in Council number O.C. 1707/84 the Corporation is proceeding to establish, in accordance with the Act, one or more waste disposal facilities (each of which is referred to as a "Facility") at one or more sites to be chosen by the Corporation, (each of which is referred to as a "Site"), and

WHEREAS Order in Council number O.C. 1706/84 established a hearing procedure under section 16 of the Act to be followed with respect to such Sites and Facilities in lieu of the approvals procedure under the Environmental Assessment Act, and

WHEREAS Order in Council number O.C. 1707/84 authorized the Corporation to proceed with obtaining approvals under the process established by O.C. 1706/84 and directed the Corporation to follow certain policies, and

WHEREAS it appears that the material the Corporation is preparing for the hearing proposed to be carried out under Order in Council No. 1706/84 should be sufficient to meet the requirements of the Environmental Assessment Act, and

WHEREAS it is therefore desirable that the approval process be conducted under the Environmental Assessment Act, and

WHEREAS it is therefore necessary to revoke orders in council number O.C. 1706/84 and O.C. 1707/84 and provide for the continued application of those policies set out in Order in Council number O.C. 1707/84 which do not relate to the hearing process which, pursuant to this order in council, is to be replaced by the Environmental Assessment Act process and to continue the Corporation's authority, under section 14 of the Act, to find Sites for Facilities and obtain approvals for them,

1. Orders in Council number O.C. 1706/84 and O.C. 1707/84 are revoked as of the 21st day of July, 1985.

2. A proclamation be issued pursuant to subsection 15(3) of the Ontario Waste Management Corporation Act, 1981, S.O. 1981, c.21, naming Sunday, the twenty first day of July, 1985 as the day on which subsections 15(1) and (2) of the said Act shall cease to apply except with respect to such activities, including the acquisition of land or interests in land, as are, in the opinion of Ontario Waste Management Corporation, necessary to facilitate the obtaining of any approvals required for the establishment of a Facility.

3. The Corporation shall follow the following policies:

(a) It shall find one or more Sites at locations other than the property described in the Schedule to the Act suitable for the establishment of one or more Facilities, and

(b) A Facility proposed by the Corporation shall not be established on a Site proposed by the Corporation until any necessary approvals under the Environmental Assessment Act, the Environmental Protection Act, the Ontario Water Resources Act and any other applicable statutes are obtained.

4. (1) The Corporation may establish, alter or enlarge an activity, enterprise or Facility in respect of wastes on any property other than the property described in the Schedule to the Act.

(2) The Corporation may carry out any activity which may be necessary

(a) to find and acquire a Site referred to in clause 3(a), and

(b) to obtain any approvals referred to in clause 3(b).

(3) It is a condition of the approvals in subsections (1) and (2) that the Corporation may only establish, alter or enlarge a Facility and accept wastes thereat, for purposes other than those referred to in clauses 2(a) and(b)

(a) after the necessary approvals referred to in clause 3(b) are obtained, and

(b) a further Order in Council has been issued under subsection 14(1) of the Act approving:

(i) the establishment of the specific Facility at the specific Site, and

(ii) in the case of an alteration or enlargement, the alteration or enlargement.

Recommended _____ Concurred _____
Minister of the Environment Chairman

Approved
and Ordered July 12, 1985 _____
Date Lieutenant Governor

Appendix C:
Legal Plan of Survey

LOT 17
LOT 18
LOT 19
CONCESSION 4
CONCESSION 3
CONCESSION 2
THE KING'S HIGHWAY NO. 20
HWY. PLAN 335
ORIGINAL ROAD ALLOWANCE
SILVERDALE ROAD
SCHRAM ROAD
VAUGHAN ROAD
HEASLIP ROAD
(SEE ALSO SPECIAL PLAN 180)
PLAN 30R-3183
PART 16
PART 17
PART 15
PART 14
PART 13
PART 12
PLAN 30R-3183
(SEE ALSO SPECIAL PLAN 180)
HWY PL 485
N.E. CORNER LOT 18, CON. 3
N.W. COR. LOT 17, CON. 3
HWY. PLANS 337 & 370
INST. NO. 465562
EASEMENT INST. NO. 140772 (1944) (Gainsborough)
5.029 (Each side of ℄)
EASEMENT INST. NO. 0M207943) (Gainsborough)
℄ ONTARIO HYDRO EASEMENT INST. NO. 1379 (1946) (Gainsborough)
PART 1
PLAN 30R-3065
INST. NO. 510776
(N 1/2 LOT 18, CON. 3)
(WITH EXCEPTIONS)
INST. NO. 447568
(thirdly)
(W 1/2 OF N 1/2 LOT 17, CON. 3)
(WITH EXCEPTIONS)
(SUBJECT TO EASEMENT)
AREA = 20.320 ha.
INST. NO. 447568
(secondly)
(E 1/2 OF N 1/2 LOT 17, CON. 3)
(WITH EXCEPTIONS)
(SUBJECT TO EASEMENTS)
INST. NO. 447568
(firstly)
(W 1/2 OF N 1/2 LOT 18, CON. 3)
(WITH EXCEPTIONS)
(SUBJECT TO EASEMENTS)
INST. NO. 15607 (1955) (Gainsborough)
(secondly)
(N 1/2 OF S 1/2 LOT 18, CON. 3)
(WITH EXCEPTIONS)
(SUBJECT TO EASEMENT(S))
℄ THE BELL TELEPHONE COMPANY OF CANADA EASEMENT INST. NO. 140772 (1944) (Gainsborough)
HALF LOT LINE
WIRE FENCE
AREA = 123.654 ha.
INST. NO. 15607 (1955) (Gainsborough)
(secondly)
(N 1/2 OF S 1/2 LOT 18, CON. 3)
(SUBJECT TO EASEMENT)
INST. NO. 134062
(S 1/2 OF LOT 16, CON. 3 & W 1/2 OF S 1/2 LOT 17, CON. 3)
INST. NO. 15375 (1954) (Gainsborough)
(thirdly)
INST. NO. 486357
(S 1/2 OF S 1/2 LOT 18, CON. 3)
℄ OVERHEAD UTILITY LINES TO WEATHER STATION
S.E. COR. LOT 18, CON. 3
TOWNSHIP OF GAINSBOROUGH NOW IN THE REGIONAL MUNICIPALITY OF NIAGARA
TOWNSHIP OF WEST LINCOLN

Appendix C

Plan of Survey

Ontario Waste Management Corporation

Environmental Assessment

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
1. THIS SURVEY AND THIS PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT AND THE REGISTRY ACT AND THE REGULATIONS MADE THEREUNDER.
2. THE SURVEY WAS COMPLETED ON THE 9 th DAY OF JUNE 19 86.

DATE JUNE 9, 1986

THOMAS G. CAHILL
ONTARIO LAND SURVEYOR

NOTE

BEARINGS ARE ASTRONOMIC AND DERIVED FROM THE SOUTH LIMIT OF THE KING'S HIGHWAY NO. 20 WHICH HAS A BEARING OF N 87°54'30" E ACCORDING TO PLAN 30R-3183.

METRIC

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

CAUTION : THIS PLAN IS NOT VALID UNLESS EMBOSSED BY A SURVEYORS SEAL.

LEGEND

-●-	DENOTES MONUMENT FOUND
-□-	DENOTES MONUMENT SET
SIB	DENOTES STANDARD IRON BAR
SSIB	DENOTES SHORT STANDARD IRON BAR
C.M.	DENOTES CONCRETE MONUMENT
IB	DENOTES IRON BAR
WIT	DENOTES WITNESS
(744)	DENOTES R.J. MATTHEWS O.L.S.
(788)	DENOTES C.J. CLARKE O.L.S.
(886)	DENOTES CLARKE & LANE O.L.S.
(MTC)	DENOTES MINISTRY OF TRANSPORTATION & COMMUNICATIONS

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T.G. CAHILL, O.L.S.
1020 MURRAY STREET
PHONE 735-1...
LOCKPORT, ONT.
L2E 3L7
37 VILLARD STREET
ST. CATHARINES, ONT.
PHONE 688-83...
L2R 5N8

PLAN OF SURVEY OF
PARTS OF LOTS 17 & 18, CONCESSSION 3
FORMERLY IN THE TOWNSHIP OF GAINSBOROUGH, NOW
TOWNSHIP OF WEST LINCOLN
REGIONAL MUNICIPALITY OF NIAGARA

DRAWN BY	CHECKED BY	SCALE	YEAR	L.I.N.	FILE
A. H.	T. G. C.	1 : 3000	1986	00550	SC-85-250

Appendix D:
List of Supporting Documents

APPENDIX D

LIST OF SUPPORTING DOCUMENTS

A: Documents Forming Part of EA

Spine Code	Document
Chapter 3	
B1	Proctor & Redfern Limited, Waste Quantities Study, 1982
B2	Canviro Consultants Ltd., Market Assessment Program. Survey of 1000 Industrial Establishments, 1985
B3	DPA Group Inc., Market Assessment Program. Special Waste Generation by Ontario's Manufacturing Industry in 1983*, 1986
B4	Ontario Research Foundation, Market Assessment Program. Estimating Waste Quantities, 1986
B5	ELI Eco Logic Inc., Environmental Effects of Special Waste*, 1986
B6	ENVIRON Corporation, Human Health and Special Waste, 1986
Chapter 4	
B7	Arthur D. Little International Inc., Hazardous Waste Management Options for Ontario, 1986
Chapter 6	
C1	Monenco Ltd., OWMC Treatment Facility. Facility Description**, 1986
C2	Proctor & Redfern Ltd., Generic Process Technologies Studies (annotated), 1982

APPENDIX D

LIST OF SUPPORTING DOCUMENTS (Continued)

A: Documents Forming Part of EA

Spine Code	Document
Chapter 6 (cont'd)	
C3	Arthur D. Little International Inc., Systems and Technologies for Treatment and Disposal of Special Wastes in Ontario, 1986
C4	Gartner Lee Associates Ltd., Evaluation of Alternate Disposal Options, 1986
C5	OWMC, Disposal Options Evaluation* - Summary Paper, 1986
C6	Monenco Ltd., OWMC Treatment Facility. Process Area Report. Incineration**, 1986
C7	Monenco Ltd., OWMC Treatment Facility. Process Area Report. Physical/Chemical Treatment**, 1986
C8	Monenco Ltd., OWMC Treatment Facility. Process Area Report. Solidification**, 1986
C9	M.M. Dillon Ltd. (for Monenco Ltd.), OWMC Treatment Facility. Process Area Report. Engineered Landfill**, 1986
C10	Monenco Ltd., OWMC Treatment Facility. Process Area Report. General Facilities**, 1986
Chapter 7	
D1	OWMC, Facilities Development Process: Phase 1 Report, 1982
D2	OWMC, Facilities Development Process: Phase 2 Report, 1983
D3	M.M. Dillon Ltd., Interim Phase 3 Technical Report: Site Selection and OWMC Map Portfolio, 1986

APPENDIX D

LIST OF SUPPORTING DOCUMENTS (Continued)

A: Documents Forming Part of EA

Spine Code	Document
Chapter 7 (cont'd)	
D4	Gartner Lee Associates Ltd., Hydrogeologic Considerations for Facilities Siting, 1983
D5	M.M. Dillon Ltd., Site Selection Process, Phase 3B: Selection of Candidate Sites - Site Selection, Vols. 1-4 including Map Portfolio, 1984
D6	M.M. Dillon Ltd., Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Site Selection, Vols. 1-3, 1986
D7	ENVIRON Corporation, Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Generic Risk Assessment, 1985
E1	OWMC, Public Consultation Report, 1987.*

Notes:

* Not available.
** Draft Report.

Government of Ontario

Gouvernement de l'Ontario

Ontario Waste Management Corporation Act, 1981

Statutes of Ontario, 1981
Chapter 21

Loi de 1981 sur la Société ontarienne de gestion des déchets

Lois de l'Ontario de 1981
Chapitre 21

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CHAPTER 21

Ontario Waste Management Corporation Act, 1981

Interpretation

1. In this Act,

(a) "Board" means the board of directors of the Corporation;

(b) "Corporation" means the Ontario Waste Management Corporation established by section 2;

(c) "Minister" means the member of the Executive Council designated by the Lieutenant Governor in Council to administer this Act. 1981, c. 21, s. 1.

Incorporation

2.—(1) There is hereby established a corporation without share capital under the name of "Ontario Waste Management Corporation".

Application of R.S.O. 1980, c. 106

(2) The Corporation is a Crown agency within the meaning of the *Crown Agency Act*. 1981, c. 21, s. 2.

Objects

3. The objects of the Corporation are,

(a) to research, develop, establish, operate and maintain facilities for the transmission, reception, collection, examination, storage, treatment and disposal of wastes including sewage; and

(b) to perform such other duties as may be assigned to it under this or any other Act. 1981, c. 21, s. 3.

Policies

4. The Lieutenant Governor in Council may formulate policies for the Corporation and the Corporation shall follow such policies in carrying out its objects under this Act. 1981, c. 21, s. 4.

Transfer of assets and liabilities R.S.O. 1980, c. 54

5. On the day this section comes into force, all assets and all liabilities of Ontario Waste Management Corp., a corporation incorporated under the *Business Corporations Act* by articles of incorporation filed by Her Majesty the Queen in right of Ontario as represented by the Minister of the Environment,

CHAPITRE 21

Loi de 1981 sur la Société ontarienne de gestion des déchets

1 Les définitions qui suivent s'appliquent à la présente loi. Définitions

«conseil» Le conseil d'administration de la Société. «Board»

«ministre» Le membre du Conseil des ministres que le lieutenant-gouverneur en conseil désigne pour faire appliquer la présente loi. «Minister»

«Société» La Société ontarienne de gestion des déchets créée conformément à l'article 2. 1981, chap. 21, art. 1. «Corporation»

2 (1) Est créée la Société ontarienne de gestion des déchets, société sans capital-actions. Constitution

(2) La Société est un organisme de la Couronne au sens de la *Loi sur les organismes de la Couronne*. 1981, chap. 21, art. 2. Application du chap. 106 des L.R.O. de 1980

3 Les objets de la Société sont les suivants : Objets

a) mettre au point, ouvrir et exploiter des installations en vue d'acheminer, de recevoir, de ramasser, d'inspecter, d'entreposer, de traiter et d'éliminer les déchets, y compris les eaux d'égout, et faire des recherches dans ces domaines;

b) s'acquitter des autres fonctions qui peuvent lui être attribuées aux termes de la présente loi ou d'une autre loi. 1981, chap. 21, art. 3.

4 Le lieutenant-gouverneur en conseil peut élaborer des directives que la Société doit suivre en vue d'atteindre les objets specifiés aux termes de la présente loi. 1981, chap. 21, art. 4. Directives

5 À la date où le présent article entre en vigueur, l'actif et le passif de la Société ontarienne de gestion des déchets, constituée en personne morale conformément à la *Loi sur les* Transfert de l'actif et du passif L.R.O. 1980, chap. 54

are, without compensation, assets and liabilities of the Corporation. 1981, c. 21, s. 5.

Board of directors

6.—(1) There shall be a board of directors of the Corporation composed of not fewer than seven members who shall be appointed by the Lieutenant Governor in Council.

Chairman and vice-chairman

(2) The Lieutenant Governor in Council shall appoint a chairman and a vice-chairman of the Board from the members of the Board.

Term of office

(3) A member of the Board shall be appointed to hold office for a term not exceeding three years and may be reappointed for successive terms not exceeding three years each. 1981, c. 21, s. 6.

Quorum

7. A majority of the members of the Board for the time being constitutes a quorum for the transaction of business at meetings of the Board. 1981, c. 21, s. 7.

Acting chairman

8.—(1) If the chairman is absent or unable to act or if the office of chairman is vacant, the vice-chairman shall act as and have all the powers of the chairman, and in the absence of the chairman and the vice-chairman from any meeting of the Board, the members of the Board present at the meeting shall appoint an acting chairman who shall act as and have all the powers of the chairman during the meeting.

Vacancy

(2) In the event of a vacancy in the office of a member of the Board caused by the death, resignation or incapacity of the member, the Lieutenant Governor in Council may appoint a person to hold office in place of the member for the remainder of the term of the member. 1981, c. 21, s. 8.

Remuneration of members of Board

9. The members of the Board shall be paid such remuneration and expenses as are determined by the Lieutenant Governor in Council. 1981, c. 21, s. 9.

Removal of member of Board for cause

10. The Lieutenant Governor in Council may remove a member of the Board from office before the expiration of his term for cause and the Lieutenant Governor in Council may appoint a person in place of the member for the remainder of the term of the member. 1981, c. 21, s. 10.

Staff

11.—(1) The Corporation may employ such persons as are considered necessary from time to time for the proper conduct of the affairs of the Corporation.

Application of R.S.O. 1980, c. 419

(2) The *Public Service Superannuation Act* applies to the permanent and probationary employees of the Corporation as

compagnies au moyen de statuts constitutifs déposés par Sa Majesté du chef de l'Ontario représentée par le ministre de l'Environnement, deviennent, sans indemnisation, l'actif et le passif de la Société. 1981, chap. 21, art. 5.

Conseil d'administration

6 (1) Le conseil d'administration de la Société se compose d'au moins sept membres nommés par le lieutenant-gouverneur en conseil.

Président et vice-président

(2) Le lieutenant-gouverneur en conseil nomme un membre du conseil à la présidence et un autre à la vice-présidence.

Durée du mandat

(3) Le mandat d'un membre du conseil est de trois années au plus. Les mandats sont renouvelables pour des durées successives d'au plus trois années chacune. 1981, chap. 21, art. 6.

Quorum

7 La majorité des membres du conseil, pour le moment, constitue le quorum pour régler les affaires lors des réunions. 1981, chap. 21, art. 7.

Président par intérim

8 (1) En cas d'absence ou d'empêchement du président ou de vacance de son poste, le vice-président agit en qualité de président et possède ses pouvoirs. Si le président et le vice-président sont absents d'une réunion, les membres du conseil présents nomment un président par intérim qui préside la réunion et possède les pouvoirs du président.

Vacance

(2) En cas de vacance du poste d'un membre du conseil en raison de son décès, de sa démission ou de son empêchement, le lieutenant-gouverneur en conseil peut nommer une personne qui remplace ce membre jusqu'à la fin de son mandat. 1981, chap. 21, art. 8.

Rémunération et indemnités

9 Le lieutenant-gouverneur en conseil fixe la rémunération et les indemnités des membres du conseil. 1981, chap. 21, art. 9.

Révocation justifiée d'un membre

10 Pour des motifs valables, le lieutenant-gouverneur en conseil peut révoquer un membre du conseil avant l'expiration de son mandat et nommer une personne qui le remplace jusqu'à la fin de son mandat. 1981, chap. 21, art. 10.

Personnel

11 (1) La Société peut, au besoin, engager le personnel qu'elle estime nécessaire à la conduite de ses affaires.

though the Corporation had been designated by the Lieutenant Governor in Council under section 28 of that Act.

Expert assistance

(3) The Corporation may engage persons under contract other than those employed under subsection (1) to provide professional, technical or other assistance to or on behalf of the Corporation.

Attendance and vacation credits R.S.O. 1980, c. 418

(4) Where the Corporation employs a person previously employed as a civil servant within the meaning of the *Public Service Act*, any attendance credits and vacation credits standing to the credit of the person as a civil servant immediately before his employment by the Corporation shall continue to stand to the credit of the person as an employee of the Corporation.

Application of employee benefit or group plan of civil servants

(5) Any benefit or group plan applicable from time to time to civil servants within the meaning of the *Public Service Act* under any act may be made applicable to the employees of the Corporation by order of the Lieutenant Governor in Council. 1981, c. 21, s. 11.

Application of R.S.O. 1980, c. 95

12.—(1) The *Corporations Act* does not apply to the Corporation.

Corporate seal

(2) The Corporation shall have a seal which shall be adopted by by-law.

Capacity and powers of Corporation

(3) The Corporation has all the capacity and powers of a natural person, except as limited by this Act. 1981, c. 21, s. 12.

By-laws, by Corporation

13.—(1) The Board may pass by-laws regulating its proceedings, specifying the powers and duties of the officers and employees of the Corporation and generally for the conduct and management of the business and affairs of the Corporation.

Borrowing by-laws

(2) Except with the approval of the Lieutenant Governor in Council, the Board shall not pass a by-law for borrowing money on the credit of the Corporation or for mortgaging or pledging any of the real or personal property of the Corporation to secure any money borrowed by or any obligation or liability of the Corporation. 1981, c. 21, s. 13.

Where approval required to establish, etc., facility

14.—(1) Except with the prior approval of the Lieutenant Governor in Council, the Corporation shall not establish, alter or enlarge an activity, enterprise or facility in respect of wastes on any property other than the property described in the Schedule.

Application du chap. 419 des L.R.O. de 1980

(2) La *Loi sur le régime de retraite des fonctionnaires* s'applique au personnel permanent et aux stagiaires de la Société comme si la Société avait été désignée par le lieutenant-gouverneur en conseil en vertu de l'article 28 de cette loi.

Aide spécialisée

(3) La Société peut engager à contrat des personnes qui ne sont pas mentionnées au paragraphe (1) afin qu'elles lui fournissent ou fournissent en son nom, une aide technique, professionnelle ou autre.

Crédits d'assiduité et de vacances L.R.O. 1980, chap. 418

(4) Si la Société engage une personne qui était un fonctionnaire titulaire au sens de la *Loi sur la fonction publique*, les crédits d'assiduité et de vacances que détient ce fonctionnaire titulaire immédiatement avant son emploi auprès de la Société sont portés à son compte d'employé de la Société.

Régimes collectifs ou d'avantages sociaux des fonctionnaires

(5) Les régimes d'avantages sociaux ou les régimes collectifs qui s'appliquent aux fonctionnaires titulaires au sens de la *Loi sur la fonction publique* en vertu d'une loi peuvent s'appliquer aux employés de la Société sur l'ordre du lieutenant-gouverneur en conseil. 1981, chap. 21, art. 11.

Exclusion du chap. 95 des L.R.O. de 1980

12 (1) La *Loi sur les compagnies et associations* ne s'applique pas à la Société.

Sceau

(2) La Société possède un sceau qui est adopté par règlement intérieur.

Capacité et pouvoirs

(3) La Société possède la capacité et les pouvoirs d'une personne physique, sous réserve des restrictions imposées par la présente loi. 1981, chap. 21, art. 12.

Règlements intérieurs de la Société

13 (1) La Société peut adopter des règlements intérieurs pour régir son fonctionnement, préciser les pouvoirs et les fonctions des dirigeants et du personnel de la Société, et traiter de façon générale de l'administration et de la direction des affaires de la Société.

Règlement d'emprunt

(2) Sous réserve de l'autorisation du lieutenant-gouverneur en conseil, le conseil n'adopte pas un règlement intérieur pour emprunter de l'argent sur le crédit de la Société ou pour hypothéquer ou nantir les biens meubles ou immeubles de la Société en vue de garantir un emprunt, une obligation ou une dette de la Société. 1981, chap. 21, art. 13.

Autorisation préalable pour une installation, etc.

14 (1) Sous réserve de l'autorisation préalable du lieutenant-gouverneur en conseil, la Société n'ouvre pas, ni ne transforme ni n'agrandit une activité, une entreprise ou une installation relativement à des déchets sur un terrain autre que celui spécifié à l'annexe.

Terms, conditions and limitations

(2) The Lieutenant Governor in Council may attach terms, conditions and limitations to an approval mentioned in subsection (1). 1981, c. 21, s. 14.

Application of R.S.O. 1980, cc. 140, 141, 361

15.—(1) The *Environmental Assessment Act*, section 30 of the *Environmental Protection Act* and section 25 of the *Ontario Water Resources Act* do not apply in respect of the following:

1. An activity, enterprise or facility,

   (a) of the Corporation; or

   (b) that is ancillary to an activity, enterprise or facility of the Corporation,

   in respect of the property described in the Schedule.

2. An activity, enterprise or facility of the Corporation approved by the Lieutenant Governor in Council under section 14.

Limitation

(2) The Corporation shall not establish a facility referred to in paragraph 1 of subsection (1) for the reception, storage, treatment or disposal of waste on any part of the property described in the Schedule unless a report is made under section 16, and the Board concurs, that the part of the property is a safe place for the facility and that the proposal for the facility is technologically sound.

Continued application

(3) On a day to be named by proclamation of the Lieutenant Governor, subsections (1) and (2) cease to apply except in respect of such activities, enterprises or facilities as may be specified in the proclamation. 1981, c. 21, s. 15.

Review of activity or proposed activity

16.—(1) The Lieutenant Governor in Council from time to time may appoint one or more persons to review any activity or proposed activity of the Corporation and to report thereon to the Lieutenant Governor in Council.

Powers

(2) Where the Lieutenant Governor in Council by order so declares, the person or persons appointed under subsection (1) shall have the powers of a commission under Part II of the *Public Inquiries Act*, which Part shall apply to such review as if it were an inquiry under that Act. 1981, c. 21, s. 16.

R.S.O. 1980, c. 411

Fiscal year of Corporation

17. The fiscal year of the Corporation begins on the 1st day of April and ends on the 31st day of March in the following year. 1981, c. 21, s. 17.

(2) Le lieutenant-gouverneur en conseil peut assortir son autorisation mentionnée au paragraphe (1), de conditions et de restrictions. 1981, chap. 21, art. 14. Conditions et restrictions

15 (1) La *Loi sur l'évaluation de l'environnement*, l'article 30 de la *Loi sur la protection de l'environnement* et l'article 25 de la *Loi sur les ressources en eau de l'Ontario* ne s'appliquent pas à l'égard : Exclusion des chap. 140, 141 et 361 des L.R.O. de 1980

1. D'une activité, d'une entreprise ou d'une installation :

   a) de la Société;

   b) qui est accessoire à une activité, une entreprise ou une installation de la Société,

   en ce qui concerne le terrain spécifié à l'annexe.

2. D'une activité, d'une entreprise ou d'une installation de la Société qu'autorise le lieutenant-gouverneur en conseil en vertu de l'article 14.

(2) La Société n'ouvre pas une installation prévue à la disposition 1 du paragraphe (1) pour la réception, l'entreposage, le traitement ou l'élimination des déchets sur une partie du terrain specifié à l'annexe si un rapport n'est pas dressé conformément à l'article 16, et confirmé par le conseil, qui porte que cette partie du terrain constitue un endroit sûr pour ouvrir une installation et que le projet d'installation est éprouvé du point de vue technique. Restriction

(3) Les paragraphes (1) et (2) cessent de s'appliquer le jour que le lieutenant-gouverneur fixe par proclamation, sauf pour ce qui est des activités, des entreprises ou des installations que la proclamation peut préciser. 1981, chap. 21, art. 15. Abrogation des par. (1) et (2)

16 (1) Le lieutenant-gouverneur en conseil peut nommer une ou plusieurs personnes chargées d'examiner une activité ou une activité proposée de la Société et de lui en faire rapport. Examen d'une activité ou d'une activité proposée

(2) Si le lieutenant-gouverneur en conseil le déclare par décret, les personnes nommées en vertu du paragraphe (1) possèdent les pouvoirs conférés à une commission par la partie II de la *Loi sur les enquêtes publiques*. Cette partie s'applique à l'examen comme s'il s'agissait d'une enquête en vertu de cette loi. 1981, chap. 21, art. 16. Pouvoirs

L.R.O. 1980, chap. 411

Minister may require reports

18. The Minister may require the Corporation to make reports and provide information to the Minister pertaining to any aspect of the business and affairs of the Corporation in such form and at such times as the Minister may specify and the Corporation shall comply with such requirements by the Minister. 1981, c. 21, s. 18.

Accounting system

19.—(1) The Corporation shall establish and maintain an accounting system satisfactory to the Minister.

Audit

(2) The accounts and financial transactions of the Corporation shall be audited annually by the Provincial Auditor and the Provincial Auditor shall report on the audit to the Minister and the Corporation. 1981, c. 21, s. 19.

Profits

20. The net profits of the Corporation shall be paid into the Consolidated Revenue Fund at such times and in such manner as the Minister may direct. 1981, c. 21, s. 20.

Annual report

21. The Corporation shall, after the close of each fiscal year, file with the Minister an annual report upon the affairs of the Corporation signed by the chairman or the vice-chairman of the Corporation and the Minister shall submit the report to the Lieutenant Governor in Council and shall then lay the report before the Assembly if it is in session or, if not, at the next ensuing session. 1981, c. 21, s. 21.

SCHEDULE

Lots 10 to 21, concession 4 and lots 10 to 21, concession 5 in the Town of Haldimand, formerly in the Township of South Cayuga, in The Regional Municipality of Haldimand-Norfolk.

1981, c. 21, Sched.

Exercice

17 L'exercice de la Société commence le 1er avril et se termine le 31 mars de l'année suivante. 1981, chap. 21, art. 17.

Demande de rapports

18 Le ministre peut exiger de la Société qu'elle lui présente des rapports et lui fournisse des renseignements relatifs à des aspects de ses affaires, sous la forme et aux dates qu'il précise. La Société se conforme aux exigences du ministre. 1981, chap. 21, art. 18.

Système comptable

19 (1) La Société met en place et utilise un système comptable que le ministre juge acceptable.

Vérification

(2) Chaque année, le vérificateur provincial vérifie les comptes et les opérations financières de la Société et présente son rapport au ministre et à la Société. 1981, chap. 21, art. 19.

Bénéfices

20 Les bénéfices nets de la Société sont versés au Fonds du revenu consolidé aux dates et de la façon que le ministre précise. 1981, chap. 21, art. 20.

Rapport annuel

21 La Société, chaque année à la fin de l'exercice, dépose auprès du ministre un rapport annuel sur ses affaires que le président ou le vice-président a signé. Le ministre présente le rapport au lieutenant-gouverneur en conseil et le dépose ensuite devant l'Assemblée, si elle siège sinon, à la session suivante. 1981, chap. 21, art. 21.

ANNEXE

Les lots 10 à 21 dans la concession nº 4 et les lots 10 à 21 dans la concession nº 5 de la municipalité de Haldimand, anciennement dans le comté de South Cayuga, dans la municipalité régionale de Haldimand-Norfolk.

1981, chap. 21, Annexe.

ÉQUIVALENTS ANGLAIS-FRANÇAIS

accounting system	système comptable
board of directors	conseil d'administration
civil servant	fonctionnaire titulaire
fiscal year	exercice
Ontario Waste Management Corporation	Société ontarienne de gestion des déchets
share capital	capital-actions

TITRES DES LOIS

Business Corporations Act	Loi sur les compagnies
Corporations Act	Loi sur les compagnies et associations
Crown Agency Act	Loi sur les organismes de la Couronne
Environmental Assessment Act	Loi sur l'évaluation de l'environnement
Environmental Protection Act	Loi sur la protection de l'environnement
Ontario Water Resources Act	Loi sur les ressources en eau de l'Ontario
Public Inquiries Act	Loi sur les enquêtes publiques
Public Service Act	Loi sur la fonction publique
Public Service Superannuation Act	Loi sur le régime de retraite des fonctionnaires